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ABSTRACT

The document focuses on the relationship of land and water in the Netherlands. Information, presented in expository, tabular, photographic, and cartographic form, is arranged in four major sections. Section I, which contains the bulk of the document, discusses water and landscape in geography: water in the Netherlands as a source of food, recreation, and transportation: water pollution: land reclamation projects throughout Holland: the role of water in town planning: and water engineering. Emphasis is placed on the strong influence of water in the Dutch landscape--a positive influence in the sense that it affords countless possibilities for economic development and a negative influence in the sense that it constantly threatens to overrun the land. Section II presents statistics on area and land use, population, and the Dutch economy. Section III, entitled "Brief Notes," surveys problems of transportation, river crossings, water engineering, and physical planning. A directory of water-related organizations in the Netherlands is also included. Section IV describes the aims and activities of the Information and Documentation Centre for the Geography of the Netherlands. (DB)

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I. D. G. BULLETIN 1978/79.

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INFORMATION AND DOCUMENTATION CENTRE FOR THE GEOGRAPHY OF THE NETHERLANDS

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FOREWORD

In the annual series of Bulletins, which has been appearing since 1974, the present edition for 1978-79 anticipates the XXIVth Congress of the International Geographical Union to be held in Tokyo in 1980. The leading article in this issue – "The Netherlands ± Water" forms at the same time a commentary to the exhibition being staged at the Congress by the IDG.

In addition this Bulletin contains the usual chapters giving a selection of the latest statistics, brief notes about recent developments having a bearing on the use of space in the Netherlands and – new in this edition – a list of exhibitions, museums and other institutions. It is hoped that this list will prove of value, both in the preparation of geographical field trips and in obtaining information for educational or study purposes.

Lastly, there follows the customary list of recent literature about the geography of the Netherlands, published in the language in which this version of the Bulletin has been compiled. The IDG also has available literature lists in other languages.

As always the Centre would welcome your comments and observations on the Bulletin and would be pleased to learn of your wishes for the next issue, as well as to answer any further requests for information or documentation.

Utrecht, 1979
Heidelberglaan 2,
3508 TC, Utrecht

Drs. Henk Meijer,
Office Manager,
IDG

Text concluded on 1st July, 1979
(except for a number of statistics which were received later).

I – THE NETHERLANDS ± WATER

INTRODUCTION

1. Water and landscape in geography.

Water is indispensable to man. Large parts of the world have too little of it, other areas are regularly threatened by an excess. Besides these problems of quantity, quality is nowadays a matter of increasing concern. In all areas where people and their activities are concentrated the conservation or supply of clean water demands ever greater sacrifices.

The low-lying Netherlands, one of the world's most densely populated countries, traversed by highly polluted rivers and washed by one of the world's busiest seas, presents a kaleidoscope of features related to the quality and quantity of water.
A study of texts about the Netherlands published *outside* the country – newspaper articles, travel books or even scientific works, school textbooks, teaching aids etc. – reveals that one aspect comes constantly to the fore: the struggle against the water. There is not one American who does not know the story of Hans Brinkers, the little boy who succeeded in averting a flood disaster by the stopping of the gap in the dike with his thumb. In at least half of all school texts about the Netherlands one finds the famous statement "God created the earth, except for Holland, which was made by the Dutch themselves".
One story is not true at all, the other not completely true.

This interest in the way in which the Dutch have defended their country against the water through the centuries or have wrested it from the sea is not surprising; in many respects the situation in the low countries on the North Sea is unique. The geographer could go further in the study of this material than he often does at present. In a modern geography handbook it would be possible, with the aid of examples from the Netherlands, to study the effects of water on spatial structure in such themes as agriculture and industry, foreign trade and internal transport, drinking water supply and the environment, sport and recreation, land subdivision and urban design. In the struggle against the water, too, it is mainly the aspects of spatial structure which are geographically relevant: what are the economic and planning consequences for an archipelago which is made more accessible by the construction of dams and bridges? For what purposes are the newly created polders used and what does this mean for the regional or national economic geographical structure?

Proceeding from this train of thought, the IDG decided to give both the leading article of this Bulletin, as well as the exhibition for the XXIVth Congres of the International Geographical Union (Tokyo, 1980) the title "The Netherlands ± Water". This article is therefore intended to serve at the same time as background information for visitors to the exhibition. (The division into sections follows that of the exhibition panels. *)

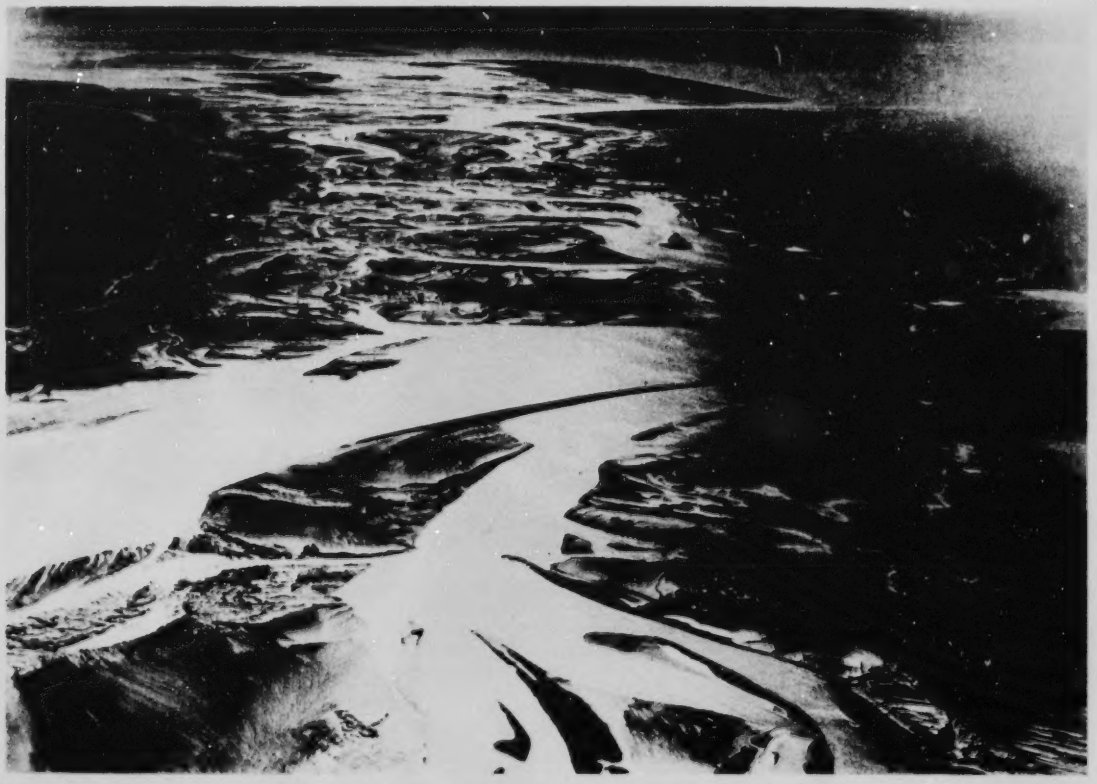
The title of the exhibition – "The Netherlands ± Water" – alludes to the positive and negative consequences which the ubiquitous water has long had and continues to have for the Dutch. The water affords countless possibilities for the development of prosperity and well-being (+), but it is also a pontential enemy which has constantly to be reckoned with (–).
The title also suggests (±) how strongly land and water are interwoven in the Dutch landscape. At the beginning of the Christian era the landscape already drove the Roman visitors to despair (photo I), when they wondered how men could live in a region" ..... where it is doubtful whether the ground belongs to the land or to the sea" (Pliny the Elder, 47 A.D.).

Both for the exhibition and for the present article the problem of excessive length has been solved by selecting first of all a number of themes, mainly of geographical relevance. The starting point for the selection was the different *functions* fulfilled by water in society, emphasizing their *spatial effects* on the landscape.

*) The exhibition and the present article are based on the 'Model for the formulation of geographical information', devised by Dr. H. S. Verduin-Muller (Utrecht, 1977).

Each theme is developed in a short, general introduction (particularly in the present article), followed where possible by a case study. In the exhibition the emphasis is on the case studies. In this way arose the following scheme for the sections of the article and the panels of the exhibition:

Chapter	Section and Panel no.		Theme
	Panel	Section	
	0		Explanation of method
Introduction	1	–	Introduction: The Netherlands ± Water
A – Functions	2	A1a	Water as a food source (fishing)
		A1b	raw material and auxiliary material for agriculture
		A1c	and industry
	3	A2	Water supply; water pollution and its prevention
	4	A3	Water as a transport medium: inland shipping
	5	A4	Water as a recreational environment
B – Spatial consequences	6	B1	Struggle against the water
	7	B2	Delta Plan
	8	B3	Zuyder Zee works
	9	B4	Water as a structuring element in rural areas
	10	B5	Water as a structuring element in urban design
	11	B6	Obstacle to traffic on land: bridges, tunnels, etc.
C – External civil engineering activities	12	C	Harbour and dredging works, towage and salvage.



Photograph 1 – *The Wadden Sea, the floor of which largely falls dry at low tide, looking west. Left, the coast of Friesland, right the Frisian islands of Ameland and Terschelling etc.*

A – Functions of Water

Introduction

This chapter pays attention, *inter alia*, to water supply and related problems (Section 3). Through the fisheries water is an indirect source of food supply for man.
In other sections of economic life also water plays an important part. Agriculture production is dependent upon the existence of sufficient groundwater, industry uses water as a raw material and aid (Section 2).
In a well-watered country like the Netherlands water is also important for transport (Section 4) and for open air recreation (Section 5). Lastly, water also unfortunately has a function to perform as a sewer; rivers and canals discharge large quantities of waste materials into the sea (this is one of the aspects discussed in Section 3).

A.1. Water as a source of food, raw material and auxiliary material

A.1.a. Fishing

As fishermen the earliest inhabitants of the low countries already used the food present in the water. In the course of the centuries this industry expanded to become one of the main means of livelihood of the coastal districts. At the present time the importance of fishing, certainly in relation to other industries, has greatly declined. In 1977 fishing accounted for no more than 0.15 to 0.20% of the national income, while the fishermen made up 0.08% of the employed population.
There are various reasons for this:

- because of the necessary modernisation of the fishing fleet and the rise in wages, costs have greatly increased;
- because of overfishing the quantity of fish and the number of species have been reduced, resulting in national and international measures to limit the catch and conserve supplies;
- the interest among the working population for the hard and irregular life of the fisherman has greatly diminished.

Here are some figures:	1971	1977
catch in millions of kg.	253	302
value in millions of gld.	277	468
income from fishing in millions of gld.	152	183
number of fishing boats	1156	933
tonnage of fishing boats (BRT)	86,816	87,215
average tonnage	75.1	93.5
number of crew members	5063	3964

There is clearly evident in fishing, as in other industries, a process of enlargement of scale and rationalisation at work: a larger catch is achieved with a declining number of ships of increasingly large size and with fewer men. Besides the sea fisheries – on the North Sea and Atlantic Ocean – there are coastal fisheries in such waters as the Wadden Sea and the estuaries of the delta, as well on Lake IJssel, where the catch includes mussels, shrimps, eels, etc.

Oyster Culture in the Eastern Scheldt

A special form of coastal fishery is the oyster culture in the Eastern Scheldt. This complicated and labour-intensive industry, which has been in existence since about 1870, is highly sensitive to physical conditions such as nature of the seabed (stable with little sedimentation), temperature and salinity of the water, and tidal movement. All these conditions are satisfied in the eastern part of the Eastern Scheldt, near the village of Yerseke, an area that was still land before 1500.

From 1870 parcels of 5 and 10 hectares – marked by sticks standing up in the water – have been leased by the State to the oyster farmers. On these oyster beds the oyster spats are first caught on "collectors", objects to which the oyster larvae attach themselves. In earlier times lime-washed roofing tiles were used for this purpose, but nowadays mussel shells are set out, which is less labour-intensive. The food content of the water and water movement (tides) determine the maximum oyster population. In the Eastern Scheldt, on 1,000 hectares of oyster bed there is room for a total of some 200 million oysters (from 0 to about 6 years old).

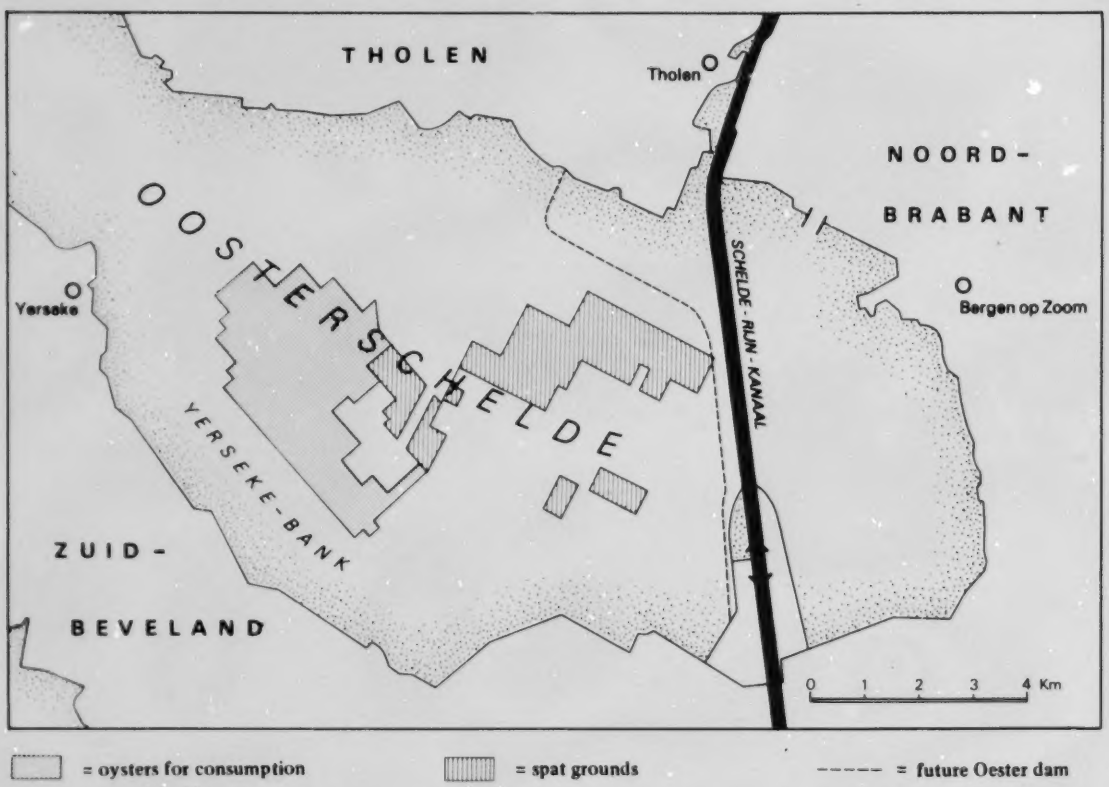


fig. 1 – oyster parcels in the eastern section of the Eastern Scheldt.

After one or two years this seed oysters are fished up, cleaned, graded and transplanted in water that is richer in food (see fig. 1). Of the total quantity of seed oysters caught eventually no more than about 6% survive to be taken for human consumption; the remainder are eaten up by other animals, perish from disease, or are rejected as being of inferior quality. The oysters are fished up again at regular intervals and, according to the demand at the time, a number of 2 to 5 year-olds are selected for sale and, if necessary, temporarily stored in oyster tanks on the landward side of the dike (see Photo II).

Export firms in Yerseke pack the oysters carefully into wooden crates and transport them to the market (principally Belgium). The remaining, younger oysters are set out again on the oyster beds.
Production in 1977 was 16.3 million oysters, worth 15.6 million guilders, of which 96% was for export.

The severe winter of 1962-63 decimated the Zeeland oyster stock. For many small oyster farmers this meant the end of their business. They received financial compensation under the provisions of the Delta Damages and other acts. Ten large oyster-breeding businesses remained and they have further reduced their risks by turning to a wider assortment of shellfish and crustaceans, including mussels and lobsters. They have also begun increasingly to import nearly mature oysters from other countries, such as France, exporting them again after a brief stay in the Zeeland waters. In a certain sense, therefore, there has been a shift from oyster *farming* to oyster *trading*.

Photograph II – *Yerseke with, centre, the oyster tanks and, behind them, the harbour. Left, the dike and part of the village, right, the Eastern Scheldt.*

About a half of the occupied population of Yerseke (total population 5,490 on 1st January 1979) is still directly engaged in breeding and trading in shellfish and crustaceans. The maintenance of the industry was one of the reasons for drastically changing the plans for sealing off the Eastern Scheldt under the Delta Plan (see, *inter alia*, IDG Bulletins 1976-77 and 1977-78 and the IDG publication "The South West Netherlands").

A complete sealing off of the Eastern Scheldt, as was originally intended, would have spelt irrevocably the end of the oyster cultures. Experiments in transferring the cultures to other coastal waters met with no success. With the "pier dam" which is now under construction it will be possible to maintain the salt content and tidal movement in the Eastern Scheldt sufficiently to enable the oyster cultures to continue. This will necessitate the construction of an additional secondary dam at the eastern end of the estuary in order to separate the tidal salt water of the Eastern Scheldt from the fresh, still water of the Scheldt-Rhine Canal and the surrounding area (see fig. 1: the "Oesterdam" (= Oyster Dam)).

A.1.b. Agriculture

The average annual precipitation in the Netherlands is more than adequate for most forms of agriculture. Only in dry summers is it necessary in horticultural and grazing areas to apply overhead irrigation to prevent the crops drying out, mainly in the sandlands of the "High Netherlands".
Regional variations in agricultural land use, to the extent that they are determined by the water economy, are often the result of differences in the groundwater table and of its control.

This can be clearly observed in the Low Netherlands, where the water level in the *polders* can be accurately controlled (a polder is an area surrounded by dikes, within which the level of the surface water and groundwater – the "polder level" – can be controlled).
In older polders reclaimed before about 1850 and drained with the aid of windmills, the still rather inadequate technology of the time often did not permit the water level in summer to be maintained at a greater depth than from a half to one metre below the surface (water levels in winter are on average 1/2 to 1 metre higher). In the 19th century polders, drained by steam pumps, and the 20th century polders, drained by diesel or electric pumps, it is possible to maintain the polder level at more than 1 to 1 1/2 metres below the surface, even though these polders are at a considerably lower elevation. They are drained lakes, the floor of which may be from 4 to more than 6 meters below sea level. *) Because of the lower water level the soil of these very low-lying polders is generally suitable for arable farming; the more marshy soils of the older polders are often suitable only for livestock farming.

The Hazerswoude drained lake and neighbourhood – Figure 2 and Photo III illustrate the situation just described as it appears in the polderland of the province of South Holland. In the centre is the village of Hazerswoude (about 20 km east of The Hague) in the centre of the "Green Heart" of the Randstand. On the left is part of the Hazerswoude drained lake, on the right is part of the polderland along the Old Rhine. The latter area lies at about 1.5 to 2 metres below sea level. The former lake had been created by the removal of peat, dug for fuel. It covers 2710 hectares and was drained in 1765 with the aid of windmills. The lake floor is from 4.5 to 5.5 metres below sea level.

The cross-section shows clearly the difference in the polder level. From the map it can be seen that the old polderland in the northern area (right) is used largely for pasture. In the drained lake – with a much more open network of ditches – arable farming predominates. In this not only the polder level, but the type of soil plays a part. In the higher, older polders the soil consists of lowland peat. In the drained lake, removal of the peat has exposed the old marine clay. Only in a strip along the edge, immediately south of the village of Hazerswoude, has the clay been mixed with peat and the water economy is also less favourable, so that here, too, grassland predominates.

In the area in the bottom left of the map horticulture is widespread, the main interest being the growing of trees and ornamental shrubs. The centre of this trade is Boskoop.

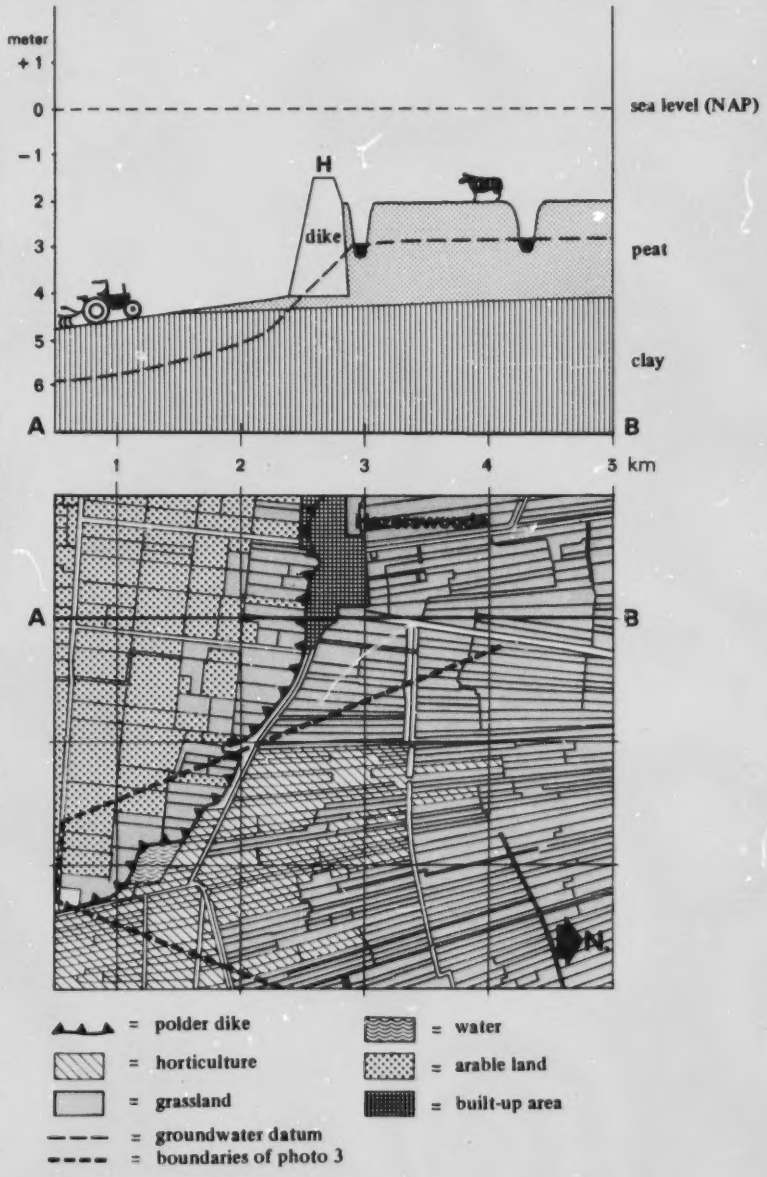


fig. 2 – polder landscapes near Hazerswoude in cross section and map.

*) In the Netherlands sea level is defined as "NAP" (Normal Amsterdam Datum), which corresponds approximately to mean *high water* level along the coast.

Photograph III — *Polder landscapes at Hazerswoude, looking north. In the centre of the photograph a small remnant of the former Hazerswoude Lake. In front of it the dike of the reclaimed lake with, in the foreground, the arable land lying at 4 to 5 metres below sea level. In the background horticultural and grassland parcels lying at 1 to 2 metres below sea level.*

A.1.c. Industry

Water can play a part in industry in many ways:

- as a means of transport for the supply of raw materials, fuel and auxiliary materials and for moving the finished products;
- as a raw material or auxiliary material, inc. cooling water;
- a special case is where a sediment brought down by the water serves as a raw material for industry.

The first function — water as a means of transport — is of great importance in the Netherlands. Both along the coast and on the inland waterways the possibility of water transport is very important for many factories. This aspect is discussed further in Section 3. Water as a raw material is important for only a limited group of industries. As an auxiliary material it is important, *inter alia*, in the paper and textile industries; the presence of ample pure groundwater, for example, encouraged the establishment of paper mills in certain parts of the High Netherlands.
More problematical nowadays is the use of water for cooling. Groundwater can usually not be used in sufficient quantity without causing an impermissible lowering of the groundwater table. If surface water from a river, for example, is used on a large scale, there is a risk that the temperature of the water will be raised to such an extent that the biological balance is disturbed. This has been called "thermal pollution".

Photograph IV – *Power station with cooling towers at Beegden aan de Maas (province of Limburg).*

1 = important power stations
2 = new power stations or extensions
cooling water capacity
3 = large
4 = medium
5 = small
6 = boundary of Low and High Netherlands

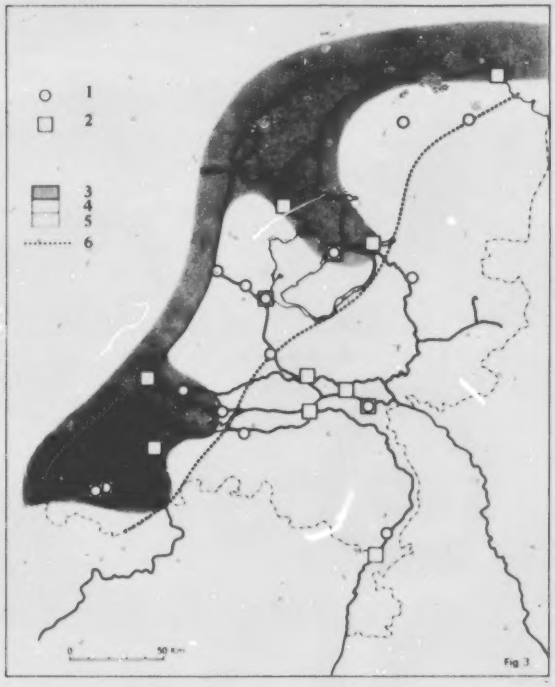


fig. 3 – electricity power stations and cooling water.

Consequently, cooling towers are built alongside electricity power stations, disfiguring the landscape, but enabling the cooling water to be re-used (photo IV). Fig. 3 shows that the problems are particularly great in the High Netherlands, where there is a relative absence of surface water. Large power stations neither exist nor are planned outside the "Low Netherlands" and the region of the great rivers.

Brick manufacture in the region of the great rivers in Gelderland

The manufacture of bricks in the region of the great rivers is the outcome of a special combination of factors. Particularly in the province of Gelderland there are many brickworks along the banks of the great rivers. In this instance the rivers have been important for the establishment of these works not only as a medium of transport – import of coal, export of bricks – but they have also been responsible through the centuries for the sedimentation of the clay which is processed as a raw material by the brickworks.
In this branch of industry also the effects have been felt of the general rationalisation following the Second World War:

	1966	1976
number of brickworks	211	120
number of workers	10,300	5,700
production (millions of bricks)	2,437	2,328
value of production (millions of guilders)	254	540.7

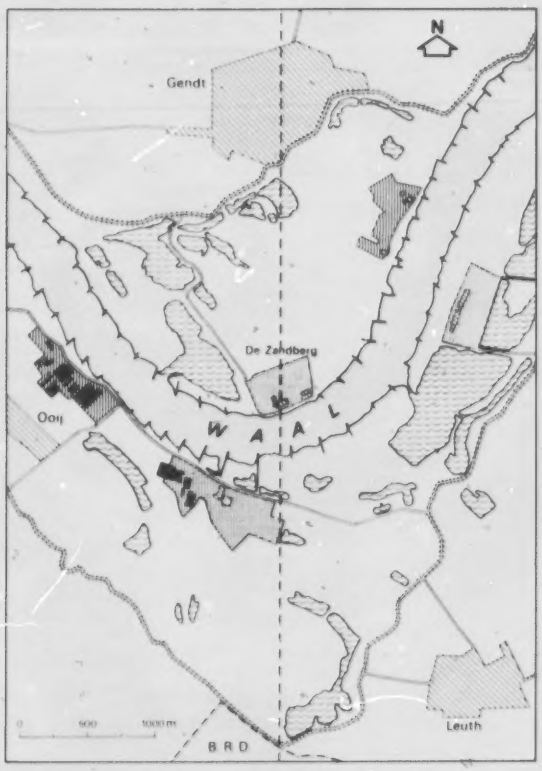


fig. 4 – brickworks on the Waal near Gendt (east of Nijmegen)

Fig. 4 and photo V show as an example the situation around the little Gelderland town of Gendt, nine kilometres north-east of Nijmegen. South of Gendt a number of brickworks are situated along the River Waal, the most important distributary of the Rhine. The map also shows the location of two former brickworks – see the reduction in the total number of works in the table above – closed as part of a radical rationalisation programme. The works are located immediately on the riverside on the "uiterwaarden" (forelands), which are strips of land on both sides of the river, situated between the summer and the winter dikes (1 and 2 resp. on the cross-section, fig. 5). Because, since the completion of the dikes in about 1400, during periods of high water level in

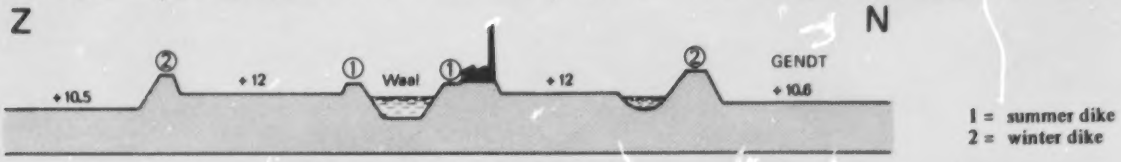


fig. 5 – cross-section of river landscape (see fig. 4); heights in metres above sea level.

winter, the river can flood only these strips of land, this is mainly where the clay which is so suitable for brick manufacture is found. For the same reason the forelands are at a level about 1 1/2 metres higher than the land behind the winter dikes. The brickworks and their access roads are situated on raised ground which is safe from high winter water levels.

The manufacture of bricks consists of the following stages:

- excavation of the clay, often to several metres below the groundwater table; a central laboratory regularly analyses ground samples from the area of clay exploitation. Because of changes in the course of the meanders over the centuries large differences in the composition and structure of the clay can occur over short distances in the forelands.
- transport to the "clay tip" near the works, where a type of clay with the optimum loam content is created by mixing different layers.

Photograp V – *Brickworks on the Waal east of Nijmegen.*

- transport from the "clay tip" to the works.
- mixing with water and shaping of the clay into bricks.
- drying of the unburnt bricks in drying sheds. This used to be done by the wind in covered racks on the brickworks site. These elongated drying sheds – see the black stripes on fig. 4 (e.g. on the site of the former brickworks far left) – are fast disappearing from the river landscape. Because of this drying method the brick industry formerly had a marked seasonal character.
- firing of the dried bricks in kilns at temperatures up to more than 1000°C. The tall chimneys of these kilns – see photo V – still form a striking element in the vast, flat landscape. From the moment that the clay enters the brickworks the total production process takes about 15 days.

Because of the excavation of clay in the forelands over a period of many years a growing number of pits have been created, which have become filled with water, sometimes over ten metres deep. The granting of a licence for excavation, which each brickworks has to obtain from the local authority, is subject to an obligation to restore the land for agriculture. By excavating a number of pits still deeper, for example, earth is obtained which can be used for filling the shallower holes for restoration to agricultural use. Use is also made of waste materials (builders' rubble etc.)
The "Zandberg" brickworks (centre of fig. 4), which, with a labour force of about 35 men, produces 27 million bricks a year, hopes to be able to exploit clay in the surrounding foreland for about another ten years. It will then gradually have to go over to the import of clay from elsewhere, such as Germany. It is interesting that, in the event of import by ship, the river will be able to regain its importance as a means of transport for these works. At present, with the use of natural gas instead of coal for fuel and transport of the bricks by lorry, the brickworks make no use at all of the river.

A.2. Water Supply

"The Netherlands, a wet country short of water" is the title of a government leaflet published in 1977 on the occasion of the Water Conference of the United Nations. It seems strange that a country which has not yet been able to end a centuries-long struggle against an *excess of water* still has to take great trouble and expense to meets its *need for water*. The explanation is that it is generally not the *quantity* of water which is inadequate, but the *quality* which is an increasing cause of concern. This is especially true of the surface water – the water in rivers, lakes, etc.

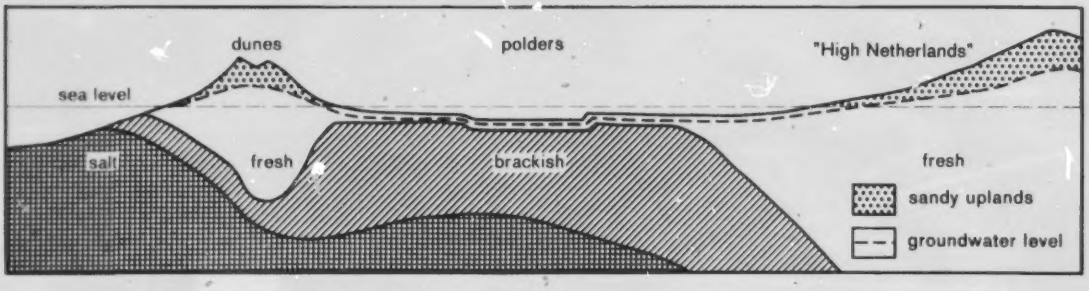


fig. 6 – W-E section across the western Netherlands; salinity of groundwater.

The cross-section (fig. 6) shows that there are great differences in respect of the water economy between the "High Netherlands" and the "Low Netherlands". (The boundary between these two is taken to be the contour line of 1 metre above NAP, which runs approximately diagonally across the country from SW to NE. All land to the north and west of this line, apart from the dunes, would be permanently or regularly inundated if it were not for the existence of dikes, polders etc.)
In the "High Netherlands", as well as under the dunes along the North Sea coast there is a large reserve of fresh groundwater. In these areas the supply of drinking water creates few problems, provided no more is used than is replenished by rain and snow. In the polderland of the "Low Netherlands" the situation is quite different. Because this area was formerly an arm of the sea, comparable with the present-day Wadden Sea, and because the fresh rainwater has to be continually pumped away to keep the polders dry, the groundwater is here saline or brackish quite close to the surface. Water for domestic use, agriculture and industry has to be abstracted from the surface water. Moreover, it is precisely in these areas that the population density is the greatest, industry the most concentrated (coast, major cities) and that farming is often intensive (in the form of horticulture).

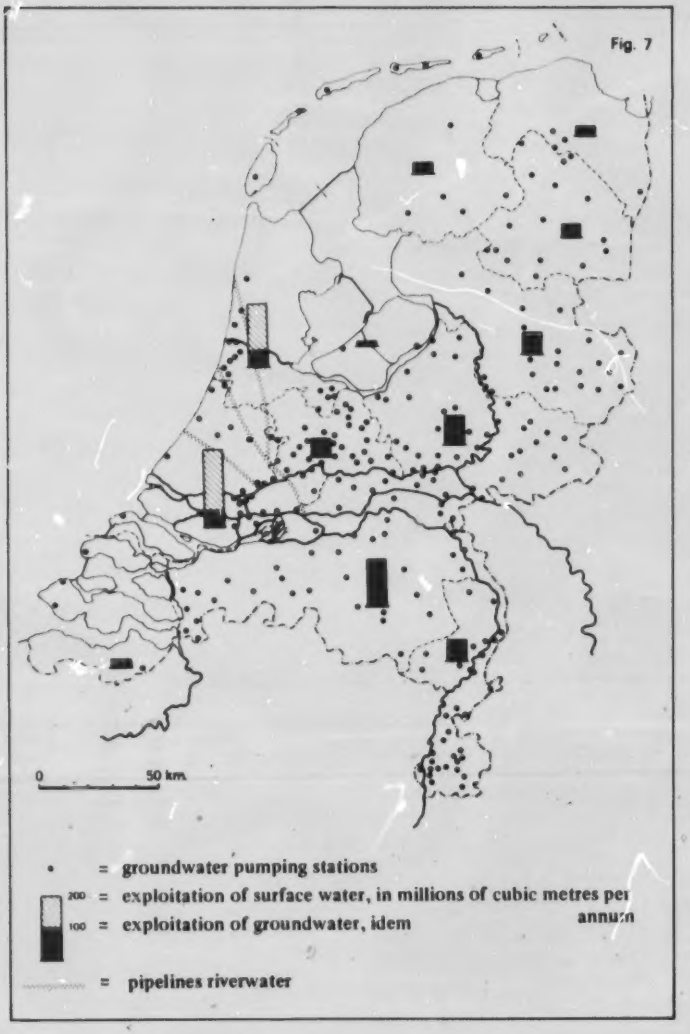


Fig. 7
0
50 km
= groundwater pumping stations
200 = exploitation of surface water, in millions of cubic metres per annum
100 = exploitation of groundwater, idem
= pipelines riverwater

fig. 7 – exploitation of ground and surface water by water supply undertakings, 1971.

Fig. 7, shows that the provinces of North and South Holland, in particular, use a lot of surface water. The majority of the groundwater pumping stations are to be found in the dune area and in the "High Netherlands".

According to a Ten Year Plan *) published in 1978 the demand for water will increase by about one third up to 1990.

Production/demand in million cu. metres		1976	1990
Water supply companies		1,085	1,585
Own exploitation by industry etc.	c.	500	500 **)
Total		1,585	2,085

**) because firms with their own sources of supply are expected to switch partly to the public supply, no provision is made for an increase under this heading.

Both now and in the future the total production *capacity* exceeds demand by some 200 to 300 million cubic metres, so guaranteeing an uninterrupted supply even in exceptional circumstances.

*) Tienjarenplan '78 – Association of Netherlands Water Supply Undertakings, Rijswijk, 1978.

About one third of the total water production is taken from surface sources. This surface water is supplied mainly by the rivers, particularly the Rhine. In an average year the water supply in the Netherlands is divided as follows:

Rhine	63%
Meuse	7%
minor rivers	3%
precipitation	27%

The Rhine is the Netherlands' largest supplier of water, but it is unfortunately also notorious as Europe's most polluted major river. The Netherlands, situated on the lower reaches of the river, suffer the most inconvenience from this pollution. In 1977 alone the Rhine transported 7 million tons of salt – i.e. 220 kg. per second or 360 mg. per litre into the Netherlands. Years of negotiations between the states have so far yielded little more than a few paper treaties (those of 1976 relating to salt discharges and chemical pollution).

The Netherlands will first have to deal with the problems within its own frontiers, striving in the first place to prevent further pollution. An increasing number of sewage treatment plants is being built. The capacity of such installations increased from 4.6 million to 18.3 million population equivalent between 1965 and 1977. (One population equivalent is defined as the quantity of decomposable organic material, the oxygen requirement of which during the process of decomposition corresponds with that of the effluent created by one inhabitant).

Legal requirements have been laid down in the Pollution of Surface Waters Act of 1970. These are based on the principle that the pollution of surface water is forbidden, with the consequence that a licence is required for discharges, a charge being made for the licence.

A second category of measures concerns the replenishment of aquifers with (purified) surface water. This is already being done by means of three pipelines running from the Lek and the Meuse to the dunes (fig. 7.) The possibilities are being investigated of applying this method to the High Netherlands as well, including the Veluwe.

fig. 8 – drinking water production around Rotterdam.

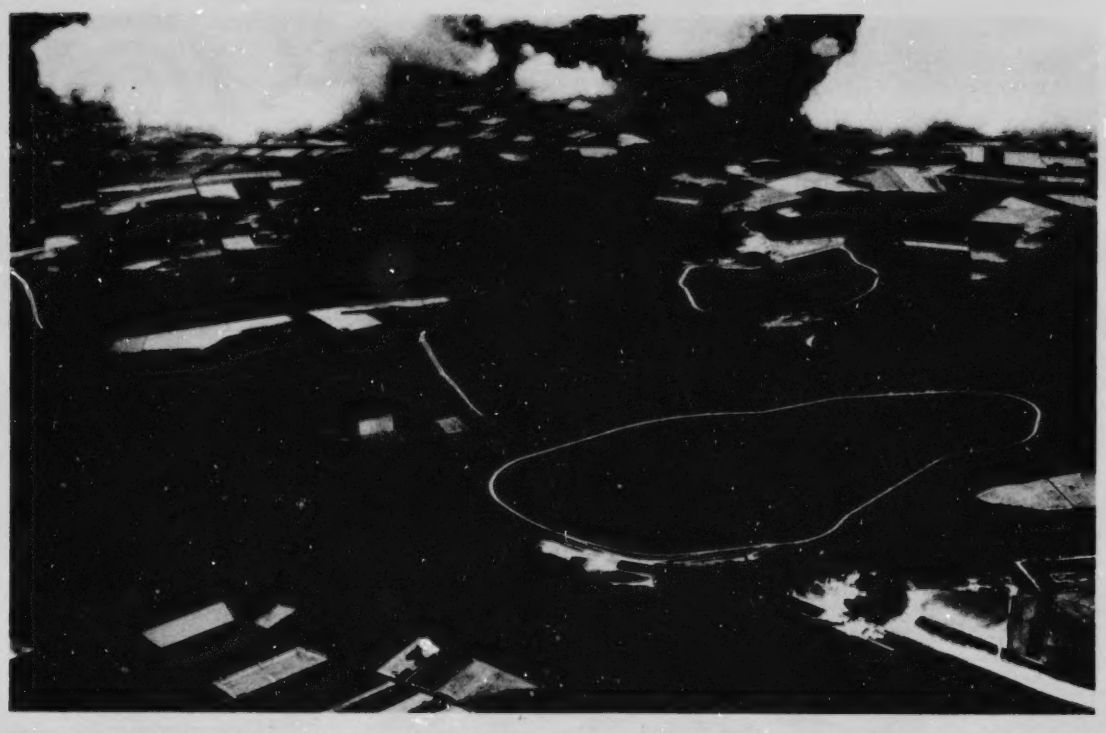
The third and most important category of measures relates to the construction of storage reservoirs in close association with the use of surface water. The underlying principle is that the quality of river water is roughly in inverse proportion to the water level. The volume of discharged waste is more or less constant, so that the lower the water level the higher the concentration of pollution. Now if the relatively clean water is stored in reservoirs during periods of high water levels, it can be used during periods of low water or if pollution occurs as a result of a disaster.

Drinking water for Rotterdam and vicinity

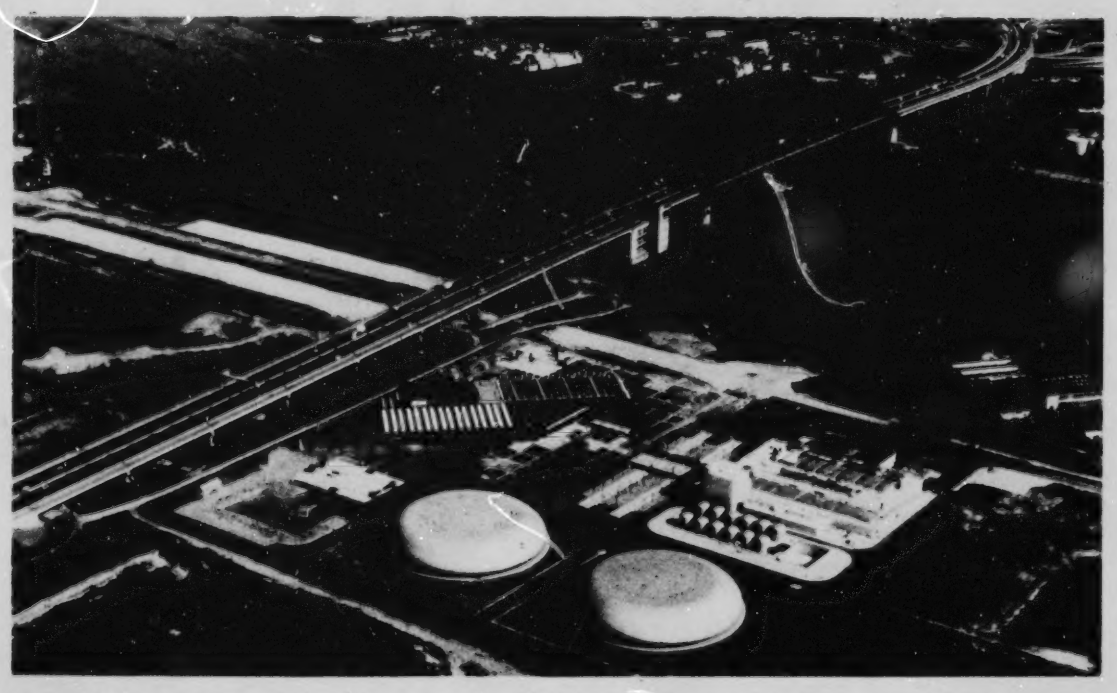
In this part of the country the problems are the greatest. Consumption is enormous, but there is no usable groundwater present, while the Rhine is the obvious source for surface water. The increasing pollution of this river made it evident in the early 1960's that radical measures would be needed. In 1978 these measures could be considered to be complete. They comprised the following stages (see fig. 8):

- the construction of a new waterworks at the bifurcation of the Spui and Oude Maas (Old Meuse) south of Rotterdam, where the river water is chemically treated to make it suitable for drinking. This Berenplaat works (photo VI) was completed in 1966. With an annual capacity of 105 million cubic metres of drinking water it is by far the largest "water factory" in the Netherlands. The water used was originally extracted from the Rhine via its distributaries the Waal, Merwede and Oude Maas.
- the construction of storage reservoirs in the Biesbos, an area which possessed the unique character of a freshwater tidal delta until the enclosure of the northern section of the Delta (1970-71). From April 1973 these reservoirs enabled Rotterdam to use the much cleaner river water of the Meuse instead of the polluted Rhine water. The main purpose of the reservoirs is to compensate for the wide fluctuations in the discharge of the Meuse, a river which is fed by rainfall. They also even out considerably the fluctuations in the quality of the river water (photo VII).

Photograph VI – *Berenplaat Waterworks, south of Rotterdam. In the foreground the treatment plant, in the background the reservoir, which is no longer in service since the coming into operation of the Biesbos reservoirs.*



Photograph VII – *Two water supply reservoirs in the Biesbos, looking north. In the foreground the Amer (lower course of the Meuse), then successively the "Honderd en Dertig" and "Petrusplaat" reservoirs. Behind them the Nieuwe Merwede (distributary of the Waal).*



Photograph VIII – *Kralingen Waterworks, Rotterdam. In the foreground the two bubble-shaped reservoirs, etc., in the background the van Brienenoord Bridge.*

The water from the reservoirs is conveyed directly to the Berenplaat works by a pipeline 30 kilometres long. There is a further pipeline to Rotterdam's second purification works in the suburb of Kralingen. In order to be able to guarantee the supply of river water from the Biesbos under all conditions the two purification plants are also inter-connected by a pipeline, so that they can supply each other with raw material in the event of a disaster.
At present three reservoirs are in operation in the Biesbos: the Petrusplaat, covering an area of 105 hectares and with a maximum capacity of 13 million cubic metres, the Honderdendertig (219 ha., 33.5 million cu.m.) and the Gijster (320 ha., 32.5 million cu.m.). The three reservoirs have a combined supply capacity of 250 million cubic metres per annum. If necessary, this capacity can be doubled in the future by the construction of a fourth reservoir.
In addition to Rotterdam the Biesbos reservoirs supply river water to western North Brabant and in the near future water will also be supplied to Zeeland.

In 1978 Rotterdam took into use a new, technically highly advanced waterworks (photo VIII) to replace the existing, obsolete purification plant in Kralingen. The river water transported here from the Biesbos is treated, among other things, with ozone. The new Kralingen works includes two drop-shaped storage reservoirs, each of which can hold 30,000 cubic metres of water. The drinking water produced in Rotterdam is destined not only for the city of Rotterdam, but also for twenty surrounding municipalities and for industries in the Rotterdam agglomeration. The total water demand is about 115 million cubic metres per annum.

Thanks to these costly projects – Rotterdam alone has invested more than 600 million guilders in the three projects described above – the largest Dutch agglomeration is now assured of an uninterrupted supply of good drinking water

A.3. Water as a Means of Transport

The sea fisheries, which have already been referred to as a centuries-old activity in the coastal areas of the Netherlands, contributed to the development of overseas commerce. As early as the Middle Ages sea captains from these districts carried an important share of the trade between the countries of the Baltic and the Mediterranean Seas. Contacts with the overseas territories in the East and West Indies led to a period of great prosperity, particularly in the 17th century.

At the end of the 19th century the rise of industry in the hinterland – especially the Rhine-Ruhr region of Germany – gave a fresh impetus to the growth of the Dutch seaports.
After the restoration of the damage caused by the Second World War, Rotterdam-Europort expanded to become the world's greatest port (see, *inter alia*, the IDG publication "The South-West Netherlands", 1978).

Other ports in the Netherlands and other countries were outstripped:

Import and Export of Goods **1977 (tonnes x 1 million)**

Rotterdam-Europort	279,9	Hamburg	53,2
Kobe	143,0	London	51,0
Yokohama	117,0	Genoa	50,5
New York	115,0	Amsterdam-IJmond	27,9
Marseilles	99,7	Terneuzen	6,0
Le Havre	80,0	Flushing	5,1
Antwerp	70,0	Dordrecht-Zwijndrecht	3,1
Singapore	64,1	Delfzijl	2,2

Sources: Rotterdam Port Authority, C B S

In *inland* goods transport shipping plays a relatively important role, certainly by comparison, with other countries:

Inland Shipping transport performance, 1976	millions of tonne kilometres
Netherlands	30.952
Federal German Republic	45.804
France	12.156
Belgium	6.072
United Kingdom	72

Source: Eurostat, 1978

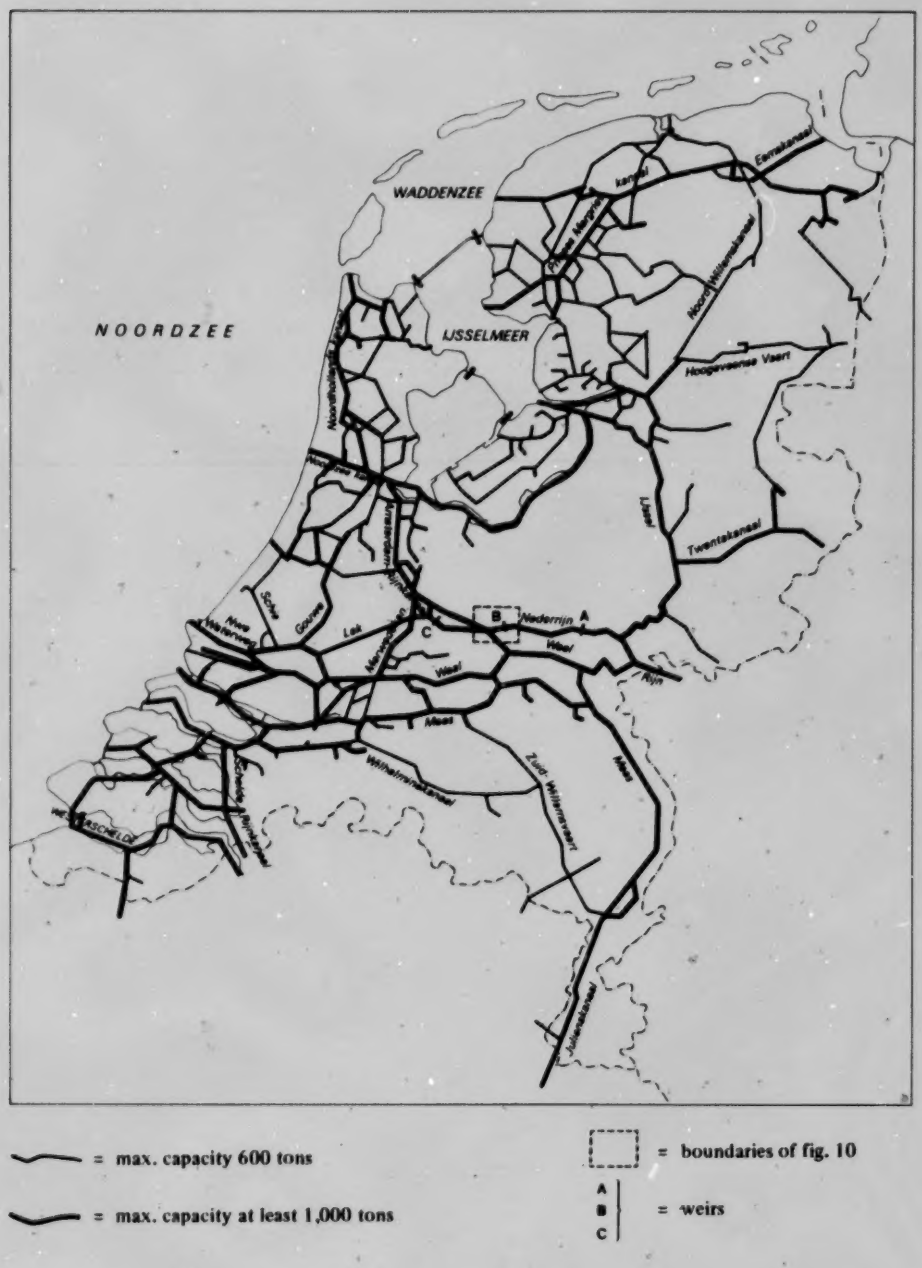


fig. 9 – waterways network

Only in the Federal German Republic is the transport performance of the Dutch inland shipping industry exceeded in absolute terms. Of the approximately 31,000 million ton kilometres performed by inland shipping in the Netherlands, more than 7,000 million was accounted for by domestic traffic and nearly 24,000 million by international traffic, with about half being carried by Dutch ships. In 1977 inland shipping was responsible for about 29% of the total domestic goods transport (in tonne kilometres). This relative share is declining, having been 43% in 1960, although the total tonnage carried is continuing to increase, despite a decline in the number of ships. Here again there have been economies of scale.

With regard to the kind of goods transported, the emphasis is strongly on bulk goods, the most important being sand, gravel and ore, followed by petroleum, agricultural products (inc. sugar beet) and fertilisers.

The lenght of the network of navigable rivers and canals was nearly 4,350 km. on 1st January 1977 (exceeded only by France among the countries listed above). This makes the Netherlands one of the few countries where the length of the waterways network exceeds that of the railway network (2,850 km).

Of the 4,350 km of waterways, 850 km consists of rivers and 3,500 km of canals (see fig. 9). The dense waterway network is therefore certainly not only a gift of nature: an important section consists of canals, locks and other artefacts. It was also necessary to make many modifications to the rivers to make them suitable for modern inland shipping: cutting off of bends, construction of weirs, dredging etc.

New developments in inland shipping – container ships, tankers, push-trains etc. – strengthen competitiveness with other means of transport, but also make increasingly higher demands on the infrastructure, which therefore has to be constantly improved and extended. Among many examples we cite the widening of the Amsterdam-Rhine Canal to accommodate trains of push barges, and the building of the Scheldt-Rhine Canal (1975) as a new link between Rotterdam and Antwerp (see *inter alia* IDG Bulletin, 1975-76, pp. 27-29). By contrast a number of small canals have been closed to shipping.

Infrastructure works around Wijk bij Duurstede

In the section of the region of the great rivers illustrated in fig. 10, measuring about 7 x 10 kilometres (for location see fig. 9), there is a range of infrastructure works serving inland shipping.
The numbers 1 - 4 used below correspond to those on fig. 10:

1. – groynes – these are small embankments, clad with basalt or asphalt, and usually constructed in the outer bend of a river at right angles to the bank. The purpose is to narrow the bed, so that the current and depth are better maintained. This measure is referred to as "normalisation".

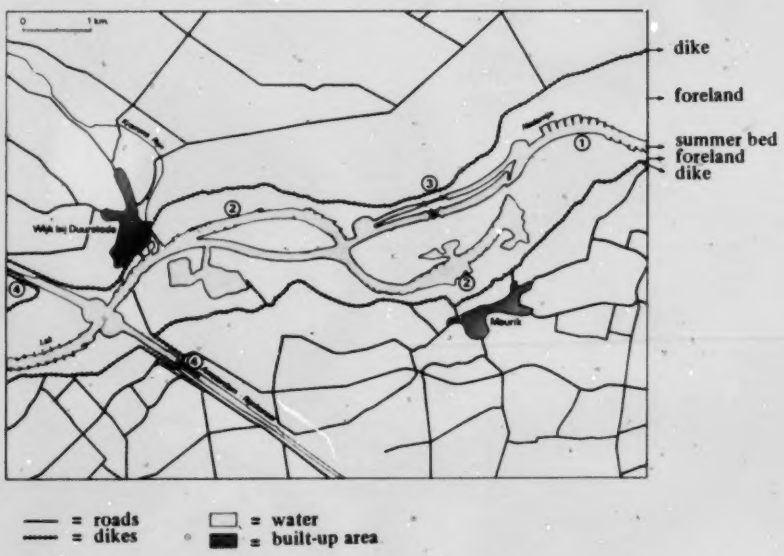
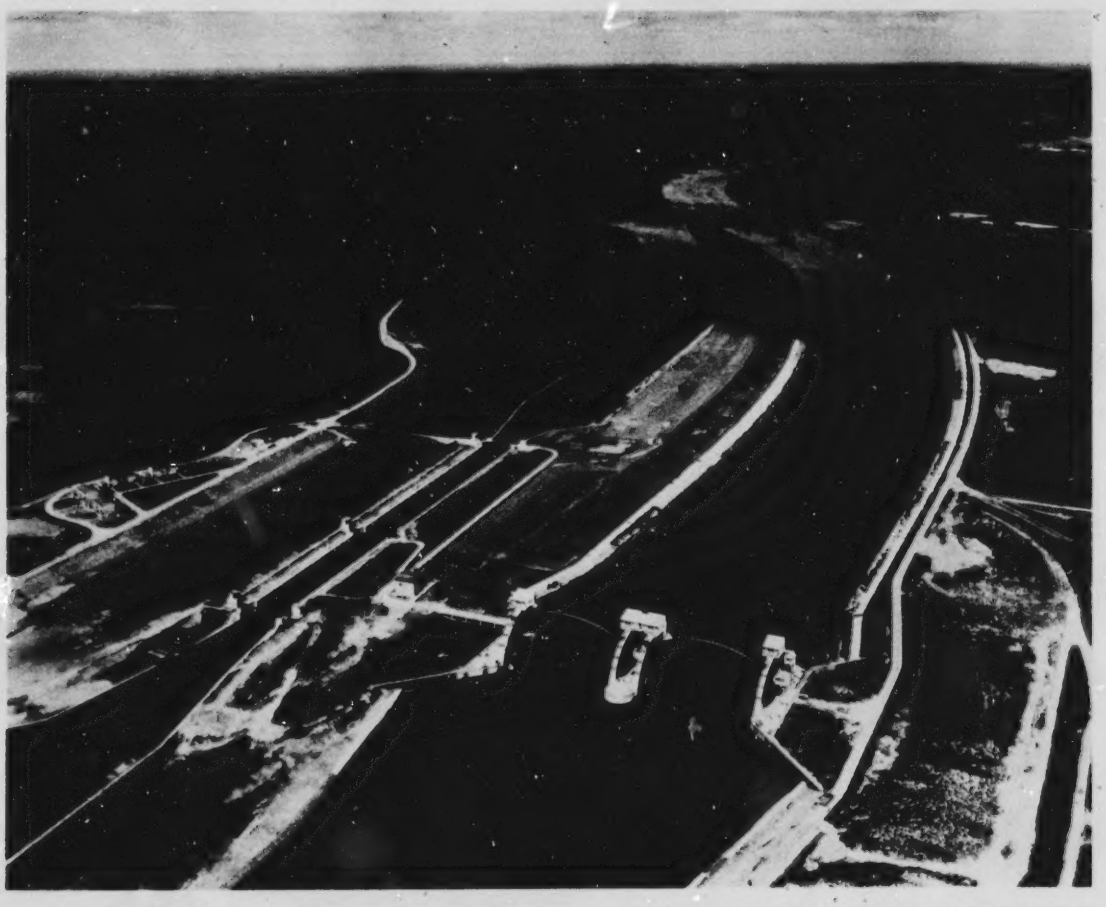


fig. 10 – water engineering works around Wijk bij Duurstede.

In the section of the Rhine adjoining the figure 1 on the map the total width of the river is about 250 metres and that of the navigation channel 130 metres. The minimum depth of the channel here is 3.75 metres and it can be navigated by ships of up to 2,000 tons.
According to the Structure Scheme for Navigable Waterways (The Hague, 1977) these normalisation measures in the Lower Rhine and Lek must be extended further, but because of the great ecological value of the forelands, they will be restricted to the "summer bed" of the river (see fig. 10).
The importance of the goods transport on the Lower Rhine and the Lek is greatly overshadowed by that on the Waal. This distributary of the Rhine, which lies about 10 to 15 kilometres farther south and is much broader and deeper, attracts the greater part of the shipping between Rotterdam and the Federal German Republic and beyond.
In addition to the goods transport recreational navigation is important on the Lower Rhine and Lek: in 1977 more than 2,600 pleasure craft passed Wijk bij Duurstede.

2. – Cut-offs

An important measure for river improvement is the cutting off of bends. This shortens the river, thereby increasing the fall and the discharge capacity. The increased speed of flow helps to maintain the depth of the channel, which brings advantages both for shipping and for the water economy. The figures 2 on fig. 10 indicate the location of old river bends which have become redundant, because of the digging of a straighter channel.



Photograph IX – *Weir and shipping locks in the Lower Rhine near Amerongen. In the background, groynes in the river bend and, right, a brickworks. Left of centre, the winding winter dike.*

3. – Weir

Between 1958 and 1970 three weirs were constructed in Lower Rhine and Lek (A, B and C on fig. 9, p. 21). They serve different purposes. By closing weir A near Arnhem the water of the Rhine is forced to enter the IJssel, so benefitting shipping on the IJssel and the water economy of Lake IJssel and surrounding territory, particularly during dry seasons. In order to prevent the water level in the Lower Rhine and Lek below weir A falling too far when the weir was closed it was necessary to construct a further two weirs in this part of the river. If all three weirs are closed the river discharge to the sea threatens to be reduced to such an extent that seawater can penetrate much farther inland than it already does (to east of Rotterdam). This danger has been averted by the construction of the Haringvliet and Volkerak dams in the region of the Delta, causing the water of the Meuse and Waal to be diverted past Rotterdam to reach the sea.

The weirs have been constructed in a special manner (photo IX). They consist of two semi-circular gates which can be raised and lowered like the visor of a medieval helmet. When they are open shipping can pass freely through two openings each 48 metres wide. When they are closed the gates form a "wall" nine metres high, about half of which extends above the water.

The shipping is then able to use a shipping lock constructed beside the weir. This naturally takes longer, but the advantage for ships moving upstream is that the current is weaker.

A pedestrian tunnel under the weir for the use of the operating staff connects the two banks. A fish sluice and a fish chute have been provided for the fish.

4. – Amsterdam – Rhine Canal

After Amsterdam had been provided with better navigation links with the sea (North Holland Canal, 1825 and North Sea Canal, 1876), the need was also increasingly felt for a good inland shipping route to the Rhine and the German hinterland (an element of competition with Rotterdam was evident here).

Photograph X – *Locks in the Amsterdam-Rhine Canal near Wijk-bij-Duurstede, looking south. In the foreground the new locks on the left, the old locks on the right. In the background the Lek with, extreme left, part of the intersection with the canal.*

In 1892 the Merwede Canal was completed, connecting Amsterdam with Gorinchem via Utrecht and Vreeswijk (fig. 9). The canal soon proved to be too small and in 1931 it was decided to construct the Amsterdam-Rhine Canal. Between Amsterdam and Utrecht it incorporated part of the considerably widened Merwede Canal; south-east of Utrecht a new connection was dug with the Rhine at Wijk bij Duurstede and the Waal at Tiel. This connection which is more than 72 kilometres long, was finished in 1952. The work of widening and deepening the new canal to accommodate the increasingly large ships has now been almost completed. The width of the canal – no more than 20 metres in 1892 – has now been increased to 100 metres; the depth to a minimum of 6 metres, while, by raising the height of a number of bridges, the minimum clearance is now 9 metres.

Within the framework of the proposals for increasing the capacity of the canal a new lock was built on the north side of the crossing in the Amsterdam-Rhine Canal. This measures 24 x 260 metres, which makes it large enough for push trains (photo X). 29,732 ships passed through this lock in 1977 (an average of more than 80 per day) with a total weight of cargo of nearly 24 millions tons.

A.4. – Water as a recreational environment

As in many other countries, there was a tempestuous development of open air recreation in the Netherlands during the 1950s and 60's, for which the familiar causes of greater prosperity, more leisure, greater mobility were responsible.

Policy and planning adjusted gradually to this development. For example, since 1965 a section of a newly created ministry (that of Culture, *Recreation* and Social Work) has been concerned with open air recreation at the national level. In physical planning, too, this aspect is being taken increasingly into account: how can existing spaces be preserved and planned in the best manner, how can new spaces be obtained?

Practical physical planning for recreation takes place mainly at the regional level. Because such planning is often concerned with areas which are cut by provincial and/or municipal boundaries, a new form of organisation has been introduced: the "rekreatieschap" (recreational board). This is a body in which provinces, municipalities and, sometimes, private organisations collaborate. The boards draw up an Outline Plan for each recreational area, which has to conform with existing regional, structure and development plans of the provinces and municipalities.

The following are some important recent developments in the field of planning for open air recreation:

- more attention will be paid to the relationship between open air recreation and nature and landscape conservation;
- policy is being related more to the immediate residential environment, a development which accords with the government's aim of slowing down the growth in the mobility of the population (see "Orientation Report" and "Structure Scheme for Traffic and Transport", which form part of the Third Report on Physical Planning in the Netherlands).

Water can play a part in open air recreation in many ways, both directly and indirectly. In the first instance, the recreational activities are pursued on or by the water. In the second instance, the water forms the "background" against which recreation takes place. According to research findings of the early 1970's forms of open air recreation directly related to the water account for a half of all open air recreation in the Netherlands.

Hundreds of thousands of people take part in recreation on the *beach* or along the *shore* (lakes, swimming baths etc.). It is becoming increasingly clear that secondary provisions, such as access roads and car parks, help to determine the capacity of these facilities.
Angling, which is practised on inland water mainly during the summer months, is very popular. There are now about 1.4 million registered anglers (a licence is necessary), i.e. 10% of the total population.
Water sports are also passing through a period of rapid growth. In 1976 the number of pleasure craft (sailing and motor boats) was estimated at 135,000, for which a water area of 3,000 sq.km. and 30,000 km of navigable waterways are available.

This capacity appears greater than it is, because about 80% of it consists of large areas of open water such as Lake IJssel and the estuaries of the Delta (the Wadden Sea is not included), where the use intensity is very low.

Many small water areas, such as the lakes in the west and north of the country are overcrowded on fine summer days. The capacity is moreover determined to a large degree by the number of moorings in the marinas. At the beginning of 1976 the Netherlands had 885 marinas, which are also used by some 5 to 10,000 foreign yachts. Increasingly drastic measures are needed to control water sports. There are, for instance, lakes where the number of speed-boats is strictly limited and nature reserves where pleasure boating is completely forbidden.
In order to prevent hindrance to inland freight shipping "traffic rules" have been drawn up, which are enforced by the National Water Police. In the new major lock complexes special locks for yachts are included (as in the Volkerak and Philips dams).

The measures favouring water sports can be applied in two kinds of area:

a — existing areas, such as the lakes and estuaries referred to above;

b — newly planned areas for open air recreation in which water plays an important part, generally in the neighbourhood of large towns.

An example of each is given below.

a — the Frisian Lakes

In the south west and centre of the province of Friesland there is an extensive complex of lakes, all of which are interconnected by waterways (fig. 11). The lakes cover an area of 97.5 sq.km. and mainly arose through wave erosion of the banks of the water courses in this peat region. The peat was also removed at a number of places in the past.

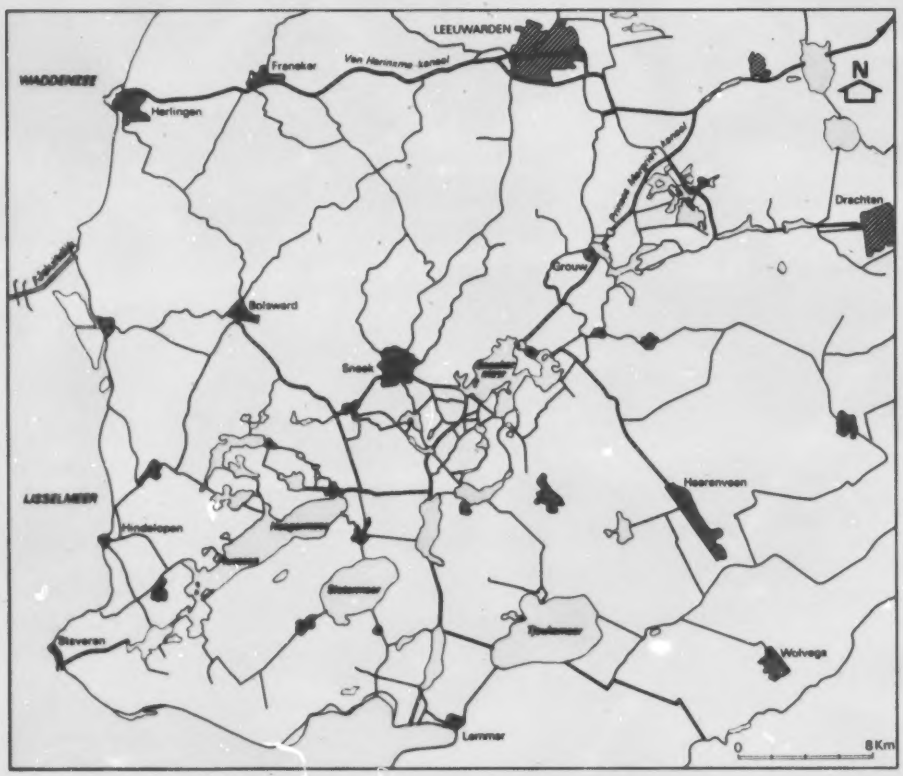


fig. 11 — lake district in the province of Friesland.

There has never been a movement to drain the lakes in Friesland. This is not only because population pressure was and is much lower than in the western Netherlands, but also more particularly because the bottom of the Frisian lakes is of little agricultural value, consisting mainly of sand and peat in contrast to held old marine clay of the drained lakes in North and South Holland.

In recent decades there has been a very large growth of interest in water sports in the beautiful Frisian lake district, amounting during the 1960's and 70's to about 8% per annum. In 1978 there were more than 23,000 pleasure craft in the region, augmented by some 3,000 boats from elsewhere.

Measures to absorb this increase, which were previously taken only by the municipalities and private bodies, but also by the province after 1960, were aimed in the first place at expanding the necessary accommodation. Since it is here much more a question of holiday accommodation than of provision for day trippers, emphasis was particularly on increasing the number of moorings and the facilities for overnight stays. The region now has, therefore, 40 kilometres of shore which have been made suitable for the mooring of boats, as well as 110 marinas with nearly 15,500 moorings, more than 100 camp sites with 14,000 pitches for tents or caravans and more than 2 200 holiday homes. An active contribution was made to this by the "Marrekrite" recreation board (see p. 25), in which 26 municipalities collaborate and the secretariat is provided by the province. Subsidies were received from the central and provincial governments.

In recent years, however, the province has been more concerned to restrict the growth of water sports and to promote a policy of regulation in order to combat the disadvantages of over-intensive recreational use.

We mention as examples:

- measures to prevent damage of the banks (and therefore to flora and fauna);
- improved regulations for the opening of bridges:

Photograph XI – *Race between "skûtsjes" – former sailing barges – at Grouw (Friesland). Left and in the background, marinas and camp sites.*

- prevention of hindrance to commercial shipping. Problems occur particularly on the Princess Margriet Canal, the important shipping connection between the north east and the west of the country (via Lake IJssel), the line of which runs through a number of lakes. An attempt is being made to improve the situation by allocating alternative routes for pleasure craft and making them fit for the purpose, and by seeing that their crews are properly informed about the "traffic rules".
- combatting environmental pollution. One of the things the recreational board has done is to organise a rubbish collection service by boat, which regularly empties dustbins and rubbish containers throughout the region. Information among the practitioners of water-sports is also an important instrument here.

These measures obviously bring with them rapidly rising costs and the province is considering letting the water sports enthusiasts contribute by means of a navigation tax.

b — Spaarnwoude

The only resemblance between the Frisian lakes and the Spaarnwoude recreation area described below lies in the fact that recreation on and beside the water plays an important part. In nearly all other respects the areas are each other's opposites.

In Friesland a number of lakes are situated in an area of nearly 1000 sq.km., which is thinly populated and used mainly for agriculture. They are used chiefly for water sports. As we have seen, the area is used mainly for longer-term visitors the number of whom has increased so much that a degree of restriction is desirable.

Spaarnwoude is an area of 27 sq.km. situated in the midst of urban development and port and industrial land and is being planned entirely for recreation. The aim is to offer a large number of day trippers the widest possible range of recreational facilities on a relatively restricted site area.

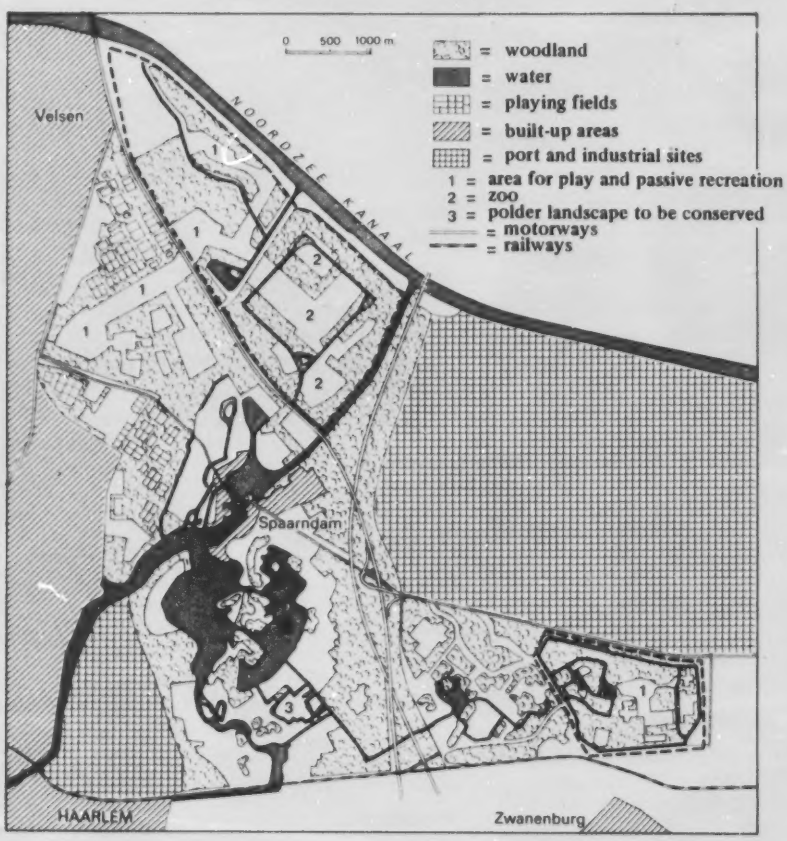


fig. 12 – Spaarnwoude recreational area

Fig. 12 shows that the area is squeezed between Haarlem and Velsen in the west and the port and industrial zone of Amsterdam in the east. The northern and southern boundaries are formed respectively by the North Sea Canal and the railway from Amsterdam to Haarlem. A motorway crosses the area from N.W. to S.E. The area therefore fulfils an obvious buffer function between the two urban agglomerations.

As far as open air recreation is concerned the North Sea beaches and dunes afford possibilities for the inhabitants of Haarlem and district, but otherwise the polderland of Holland – apart from the lakes – can accommodate only a limited number of recreational visitors. Consequently it is difficult, particularly for the approximately 1 million inhabitants of the Amsterdam agglomeration to enjoy open air activities in the near neighbourhood of the city.

The province and the municipalities concerned had already asked the central government at the beginning of the 1960's for help in realising a recreational project in this area. The first plan was submitted at the end of 1966. A foundation for the Spaarnwoude Recreational Area was set up (later converted into a recreational board) and the execution of the plans began in 1971. The investments are subsidised for 75% by the Ministry of Culture, Recreation and Social Work, the remaining 25% being paid by the province and municipalities. The participants in the foundation – the province and five municipalities – have to meet half the maintenance and management costs, with the Ministry paying the other half.

The aim is to provide as far as possible free admission to the recreational facilities in the area. The outline below lists some of the facilities included in the plan:

- water sports facilities
- course for canoe races
- shore-based recreation
- play and rest areas
- golf links, playing fields
- zoo, riding stables, children's farm
- nature reserves
- cycle racing track

Photograph XII – *Part of the Spaarnwoude site, which is to be laid out as a recreation area, looking N. In the foreground the road and railway from Haarlem to Amsterdam. Left, part of the Haarlem industrial estate (with a sewage treatment works etc.). Centre, the lake known as "Mooie Nel", with Spaarndam in the background.*

The facilities listed in the left-hand column have a direct or indirect link with the water. Water was already present in abundance in this polder landscape in the form of a river, some lakes and canals. In some places the water area will be further extended, for example, the area south of Spaarndam marked with a star on fig. 12.

By employing a clear demarcation between the different forms of recreation in the planning of the area it is hoped that there will still be areas of peace and quiet even when the area is used to its full capacity (200,000 visitors). In some parts, for example, the original polder landscape, used largely for grazing, will be maintained.

It is imperative that visitors should be able to reach the area by cycle and public transport, as well as by car. At the beginning of 1979 the laying out of the two areas outlined on fig. 12 had been more or less completed. The outline plan illustrated in fig. 12 will be amended where necessary as part of a continuous monitoring process.

B – Spatial effect – introduction

Water is present in the Dutch landscape to a plentiful degree. In many instances the situation of that water in the landscape has been influenced and modified by man. Many areas which, by nature, would be under water are now land as a result of reclamation schemes etc. On the other hand, however, the water area has been considerably increased through the digging of canals and ditches and as a result of the removal of the subsoil, for example, by the removal of peat layers or the dredging of sand and gravel.

8.5% of the total area of the Netherlands consists of water more than 6 metres wide (no figures are available for the smaller water areas). There are of course wide regional variations:

Province	a. total area in square km.	b. waters wider than 6 m, (in sq. km).	b. as % of a.
Drente	2681	37	1,38
Overijssel	3928	124	3,16
Gelderland	5131	121	2,36
Utrecht	1395	67	4,80
N. Brabant	5106	194	3,80
Limburg	2209	43	1,95
total High *) Netherlands	**20450**	**586**	**2,87**
Groningen	2499	170	6,80
Friesland	3865	525	13,58
N. Holland	2912	256	8,79
Z. Holland	3326	457	13,74
Zeeland	2745	955	34,79
S. Lake IJssel Polders	1152	191	16,58
total Low *) Netherlands	**16499**	**2554**	**15,48**
TOTAL NETHERLANDS	36948	3138	8,49

*) this division of the provinces into groups corresponds only very generally with the division into the High and Low Netherlands; the boundary between the two regions cuts across the provinces of Groningen, Friesland, Overijssel, Utrecht and North Brabant.

It will be apparent that water is more prominent in the landscape of the Low Netherlands than in the High Netherlands. The struggle against the water has long been one of the reasons for this: dikes and pumping stations, barrier dams and polders dominate the landscape of the Low Netherlands (sections B1 - 3).
Also in the physical lay-out, both of the towns and the rural areas, water is duly taken into account (sections B4 and 5).

For land traffic water forms a troublesome barrier which has to be overcome by means of ferries, bridges, tunnels and aquedaucts (section B6).

As a result of their experience with all these works the Dutch are often called upon to help with the planning and execution of water engineering works outside their own country (section C).

B.1. – Struggle against the water–

Reference has already been made to the low-lying situation of the North and West of the Netherlands and the consequent necessity of taking measures to deal with an excess of water. The area where these problems occur cover about half of the country, referred to as the "Low Netherlands". If the region of the great rivers, another area that would experience great annoyance from excess water in the absence of protective measures, is added to this, one arrives at approximately 2/3 of the total area of the country (*not* to be confused with the 27% of the country lying *below sea level;* see fig. 13).

fig. 13 – High and Low Netherlands

In about two thirds of the country, therefore, the inhabitants have for many centuries had to take measures to protect the land they live on from the nuisance of excess water. These efforts have set a marked stamp on the landscape of the areas in question: the visitor sees dikes and dams to turn back the water, canals and ditches to carry the water away, windmills and pumping stations to raise the water to a higher level.

In section A.1.b. (p. 10) *polders* were mentioned in this connection. We should first like to remove two common misconceptions about polders:

- not only the reclaimed portion of Lake IJssel, but almost the whole of the Low Netherlands consists of polders (there are c. 1000);
- not all polders are situated below sea level; the elevation can vary from about 1 metre above to more than 6 metres below sea level (see further "Compact Geography of the Netherlands", pp. 10-11).

A long history precedes the existence of these polders. The first inhabitants of the low-lying coastal areas threw up artificial mounds to which they could flee in times of flood danger, or on which they built their houses and, sometimes, even whole villages. In the north of the provinces of Groningen and Friesland there used to be thousands of these "terpen", but many were later dug away because the earth of which they were made formed excellent material for improving the soil.

At a certain point in time people began to link the different mounds together by means of embankments. This was the beginning of dike construction. When an area had been completely enclosed by these embankments and there was an opening in the dike that permitted the surplus water to be discharged to the sea at low tide, it was possible to speak for the first time of a polder. Later, the excess water was removed by mechanical means, the techniques for which show a lengthy development from the dragging of "bailing buckets" over the dike by man or beast, by way of windmills and steam pumps, to the present-day diesel or electric pumps.

The common characteristic of all polders is that a surplus of water has to be removed:

Water Economy of a Polder

In	Out
Precipitation	Consumption
Seepage water *)	Evaporation
	Surplus

*) Water which penetrates by way of the groundwater into the polder through the soil and under the dikes.

To deal with this every polder has a system of waterways in which the water is collected and transported to the point where it can leave the polder. This network of waterways, together with the attendant "artefacts", such as dikes and pumping stations, give the landscape of the Low Netherlands – including many of the older parts – a planned appearance, dominated by straight lines. The lay-out and maintenance of this polder landscape imposes many heavy demands, not only in the technical, but also in the organisational sense.

As early as the Middle Ages the polder inhabitants were faced with the task of preserving by communal effort an area once it had been wrested from the water. The first "waterschappen" (drainage districts), of which there are now still 577 (1st January 1978), *) were created at that time. They are public bodies and fall under the responsibilities of the provincial authorities. The executive is elected by the "ingelanden" (landowners) of the polders. In the drainage districts which have to carry out protective works against the sea, Lake IJssel, or the great rivers, the members of the executive are appointed by the Crown.

The activities of the drainage districts lie in the field of dike construction and maintenance, water economy (both quantity and quality), the land and waterways and, sometimes, recreation and nature protection. The money for carrying out these tasks is obtained from a drainage tax levied on the landowners, supplemented, where necessary, by subsidies from the central or provincial government.

*) because of reorganisation this number is constantly declining.

01 23

The Haarlemmermeer Polder

The struggle against the water has always had a dual aim throughout the centuries. Originally the main concern was to turn back the water in order to keep homes and lands dry, but with the advance of technology, man went over to the attack, i.e. to winning back land which had been lost to the water through the ages. The draining of the Haarlemmermeer (Haarlem Lake) is an example which combines both these aspects. In earlier times there were in the region between Haarlem, Leiden and Amsterdam a number of peat bog lakes of varying extent. Because of erosion of the peaty shores during periods of high winds these lakes had become amalgamated into a single large lake, with an area of 18,000 hectares by the mid-19th century. This great lake threatened the towns on its margins.

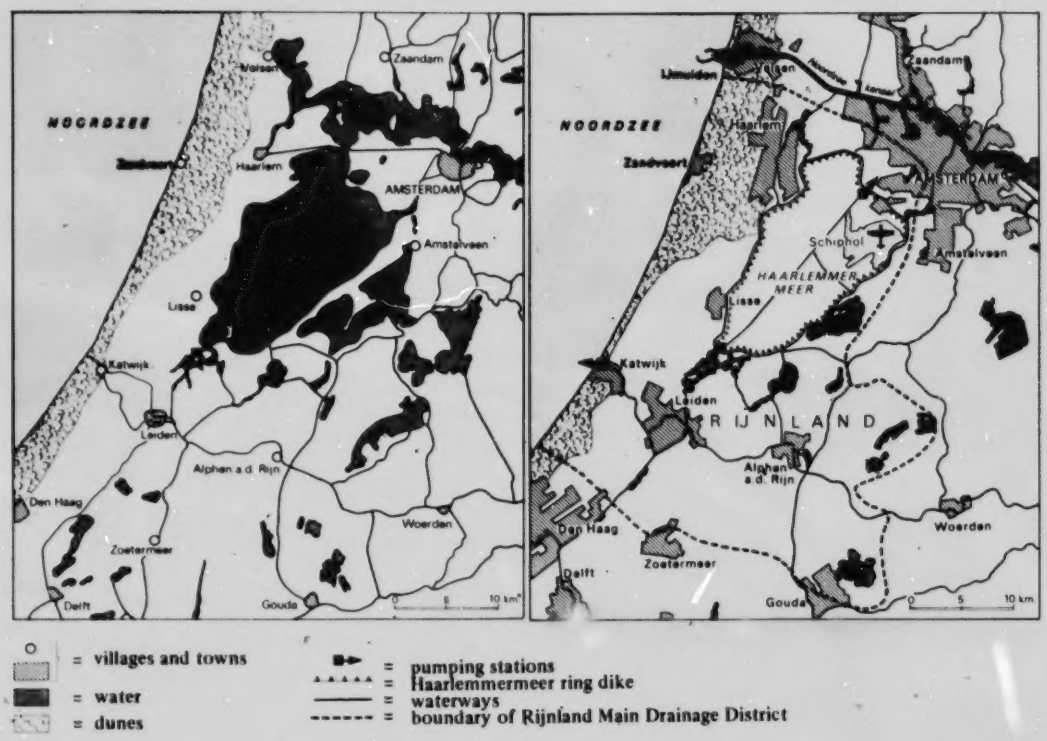


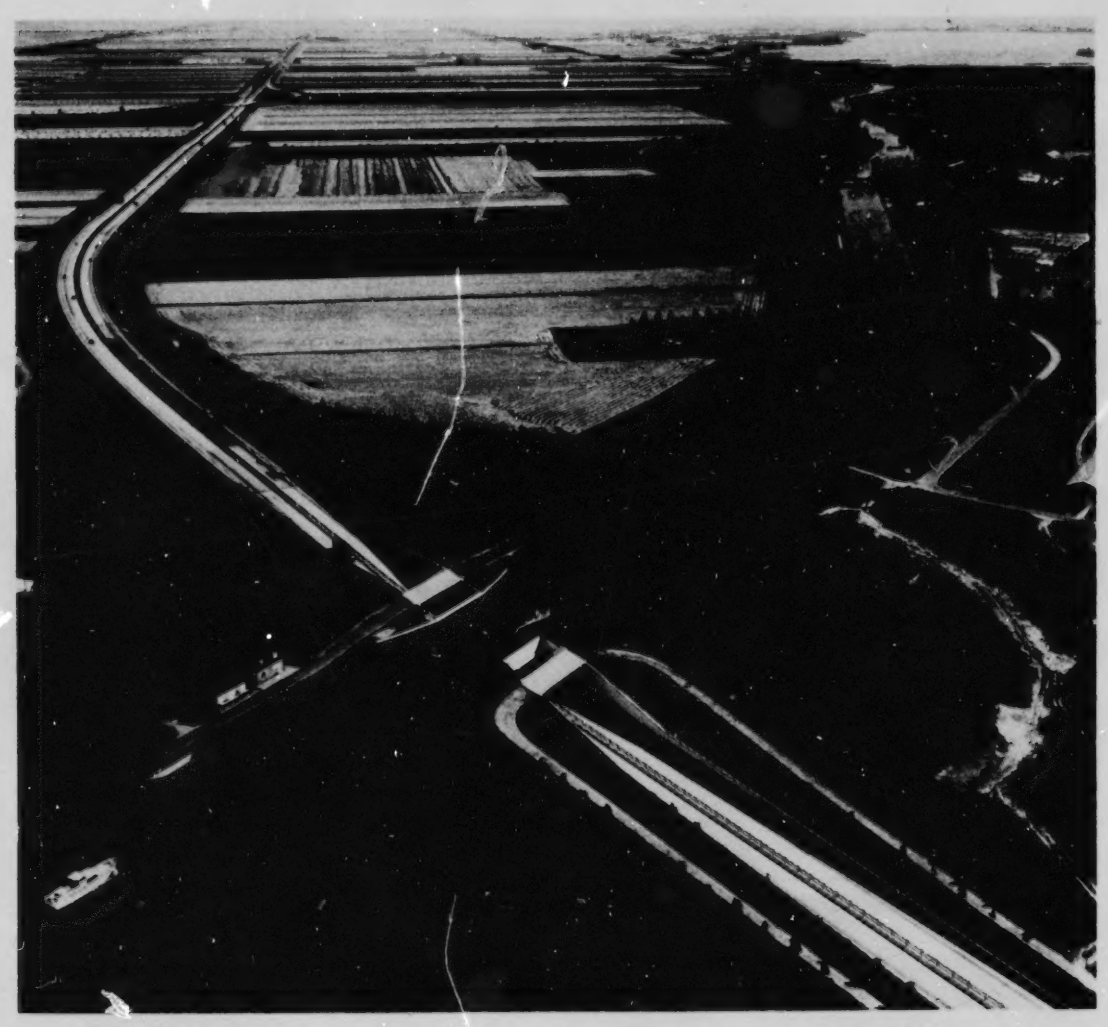
fig. 14 – Haarlemmermeer c. 1800 and now.

During the 17th century the area of arable land had been successfully augmented by the drainage of a number of lakes in North Holland with the aid of windmills. Already at that time eyes had been turned to the Haarlemmermeer. A plan appeared to pump the lake dry with the aid of 160 windmills. The plan was never carried out, partly because the lake was regarded as indispensable for the temporary storage of excess polder water.
Not until the steam engine had proved its capability for pumping up water were the plans taken up again. Three steam-operated pumping stations were built, a double ring dike enclosing a ring canal was constructed and, in 1852, after three years of pumping, the polder was drained. (One of the three pumping stations – the Cruquius, near Haarlem – has been preserved and is now open as a museum). The floor of the polder consisted of clay, which proved to be very suitable for arable farming.
The first generation of farmers, however, was not able to enjoy the benefits of this. They had to face completely unaided the extremely heavy task of laying out the muddy waste and making it cultivable. Government help, in the form that it now exists in the Lake IJssel polders during the early years after drainage and of colonisation, was not then available. The government had untertaken the drainage in the first place from considerations of land protection. The costs had to be recouped as quickly as possible through the sale of the drained land to the private sector.

In order to be able to sell the maximum amount of land the roads and waterways were kept as narrow as possible, which was not conducive to the water economy.

The drainage of the polder did not end the struggle against the water, which continues to the present day, although it now goes on largely underground. In each polder the water level must be maintained by pumping at a particular depth below the surface. In the Haarlemmermeer polder this caused great difficulties at first, not only because the canals were too narrow (see above), but also because of the basin-like form of the former lake floor, which slopes down from 3.5 metres below sea level on the margins to −4.6 metres in the middle. Consequently, the groundwater was often too low for the farmers in the outer areas and too high for those near the centre. The situation was later improved by such means as the installation of more powerful pumps (driven by diesel and electric motors) in the two remaining pumping stations. Also, at a later stage, many farms installed their own pumps, so that they could adjust the water level to their own requirements – supplementary to the overall control. This also applies to the airport of Schiphol, which was established in the polder in 1920 (the name indicates a place in the former lake where many ships went down in bad weather).

The discharge of excess water from the polder is the task of the polder administration of the Haarlemmermeer. Two pumping stations, one in the north and one in the south, pump the water into the ring canal.



Photograph XIII – *The ring canal of the Haarlemmermeer Polder crossing the Amsterdam – The Hague motorway on an aqueduct. Left, arable land in the south of the Haarlemmermeer.*

Foto XIV — *Part of Schiphol airport in the north of the Haarlemmermeer.*

Ultimately, the water has to be discharged to the "external water", i.e. the sea and all the waters in open connection with it. This is now the task of the hoogheemraadschap (union of drainage districts) – in this instance that of Rijnland, which extends over the northern part of the province of South Holland and the southern part of North Holland. The water from the polders in this area is collected in a system of interconnected ring canals, canals, lakes etc., the so-called "boezem", from which the water is discharged to the external water, usually by further pumping.

For the Haarlemmermeer this means in practice (see fig. 14) that the water is discharged partly to the north (via the North Sea Canal to the North Sea, pumping station at IJmuiden) and partly to the south (via the Old Rhine to the North Sea, pumping station at Katwijk). In order to finance all this the landowners in the polder pay a special tax both to the polder and the hoogheemraadschap. In 1979 the taxes amounted to a total of 123 guilders per hectare.

Schiphol – the only airport in the world that lies more than 4 metres below sea level – now covers 1750 ha, which is almost 1/10 of the polder. Despite the presence of this airport and other new elements in the polder (residential quarters for commuters, industrial estates, motorways, a railroad under construction) the planned character of the agricultural landscape, as laid out in the former century, still predominates (photo XIII).

B.2. – Delta Plan

We have already reported in detail elsewhere about the pre-history, execution and consequences of the Delta Plan (e.g. in the I D G Guide to the South West Netherlands). Within the present context, therefore, it will suffice to give a short résumé before concentrating attention on the developments in a particular area: Lake Veere.

As readers will know, the flood disaster of 1953 was not the occasion for drawing up the Delta Plan – a start had already been made earlier – but it was a stimulus to accelerating the execution of the plan. As a result, the following elements were completed between 1950 and 1972 (see fig. 15):

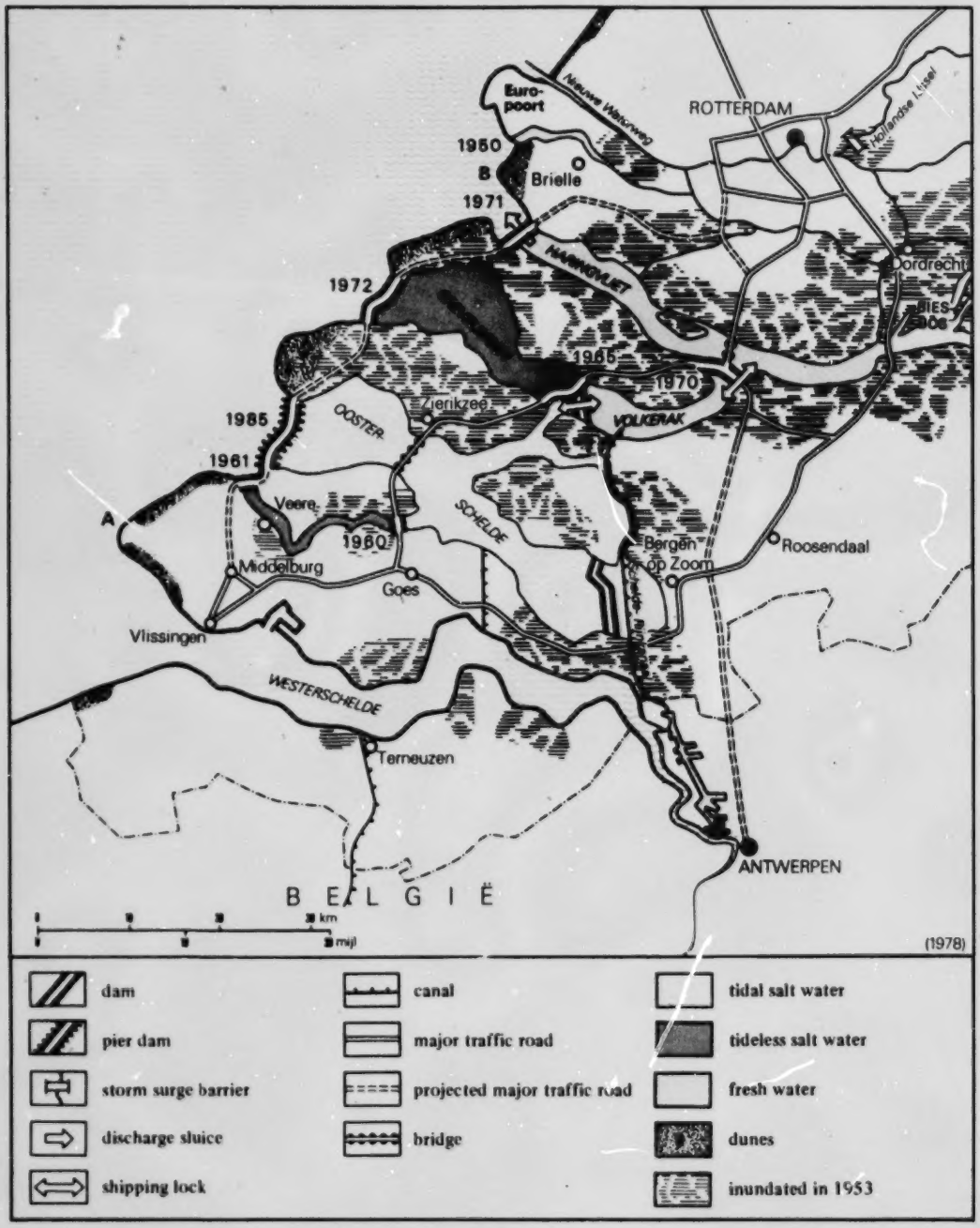


fig. 15 – Delta Plan.

1. Storm surge barrier in the Holland IJssel (1957)

– primary barrier dams in four estuaries:
  2. Brielse Maas (1950)
  3. Haringvliet (1971)
  4. Brouwershavense Gat (1972)
  5. Veerse Gat (1961)

– three secondary dams:
  6. Volkerak Dam (1970)
  7. Grevelingen Dam (1965)
  8. Zandkreek Dam (1960)

As a result of regional initiatives the above were supplemented by two bridges:
  9. Haringvliet Bridge (northward from the Volkerak Dam).
  10. Zeeland Bridge (south of Zierikzee).

At the last moment (1976) it was decided to carry out the final primary dam, which still had to be built, in the Eastern Scheldt in the form of a pier dam, i.e. with openings that could be closed in time of need. This necessitated the construction of two extra secondary dams. The following dams, therefore, still await completion:
  11. Eastern Scheldt Dam
  12. Philips Dam (south of the Grevelingen Dam)
  13. Oester Dam (near Bergen op Zoom in the eastern part of the Eastern Scheldt).

The whole Delta Plan, including the reinforcement and raising of the dikes along the open shipping passages of the New Waterway and Western Scheldt, has to be completed by 1985.

Apart from the often impressive technical achievements associated with the execution of these works it is mainly the following aspects which are of interest to the geographer:

1. What are the consequences of the execution of such a far-reaching project for the area concerned?

2. What changes have occurred during the years in the approach to and evaluation of these consequences, and to what changes can this lead in the plans?

As far as the consequences are concerned, the most important of these is the increased safety. As a result of the execution of the Delta Plan the sea is being largely excluded from the waters of the South-West Netherlands. Besides the great advantage of the reduction of the flood danger this also means that the struggle against salt penetration – the enemy of farmers and market gardeners throughout the Low Netherlands – can be pursued successfully here. Moreover, new possibilities are being created for water supply and water sports.

Another important effect is the opening up of this previously isolated archipelago by means of the roads which have been or are being constructed over the dams and bridges. This has set in train radical changes in the traditional agricultural scene of the Delta region. It may be expected that industrial and commercial activities and the associated urbanisation will develop further, particularly in the northern part of the area (Rotterdam-Europort), in the east along the new land and water links between Rotterdam and Antwerp and in the south along the Western Scheldt (Flushing, Terneuzen). The central zone will have in the first place to maintain its agricultural function, while the sea coast, with its wide areas of dunes, and the dammed estuaries are intended for recreational use for the inhabitants of the Randstad, among others.

The disadvantages which are inevitably attached to a project of this kind were allowed for from the beginning. An example are the fishermen who had to give up their livelihood because of the sealing off of particular estuaries and had to be compensated under the provisions of the Delta Compensation Act.

It is remarkable to observe how, in the more than 25 years which have elapsed since the flood disaster, the value which was attached to particular advantages or disadvantages has changed. This influenced the balancing of positive and negative effects and consequently sometimes also the execution of parts of the plan. A particularly important part was played in this regard by the greatly increased concern for the natural environment and for the damage which might be caused to it by the damming of the estuaries. The most striking example of this are the recent changes in the plans for sealing the Eastern Scheldt.

In 1976 when the dam which was planned to seal off the Eastern Scheldt completely in 1978 was already under construction, it was decided to build a much more expensive pier dam. Sixty three openings, which will be closed only in times of danger, ensure that the water in the Eastern Scheldt will remain salt and that more than 75% of the tidal movement will be maintained. Reference was already made in Section 2a to the importance of this decision for the oyster cultures, but it also means that other elements of the rich natural environment of this estuary will be saved.
The costs of the construction of this pier dam and the two "additional" secondary dams are estimated at more than 4,100 million guilders. This is 2,500 million guilders more than the originally planned Eastern Scheldt dam.

Veere and Lake Veere

Lake Veere, which was dammed off from the sea in 1960/61, and the little town of Veere provide striking examples of the themes referred to above, i.e. far-reaching consequences and changed ideas about advantages and disadvantages:

1 – the small town of Veere changed within a few years from a fishing port to a water sport centre.

2 – With regard to Lake Veere, which was regarded until recently as a welcome possibility for increasing the area of fresh water in Zeeland, a discussion is now in progress on the question of whether this lake should contain brackish or salt water in the future.

With reference to 1 – the changes for Veere may be read off from the bare figures: the number of fishermen among the economically active population fell considerably. The tertiary sector – now largely orientated towards water sports and recreation – shows the opposite picture. The character and outward apperance of the little town also clearly reflect these changes: because of the construction of the dam in the Veerse Gat the harbour of Veere changed overnight from a fishing harbour into a yacht harbour.
For many people the financial situation has certainly not worsened, but the changes are not greatly welcomed, particularly by the older inhabitants. The small, closed fishing community has been disrupted, many houses have been bought by city dwellers as holiday homes and are therefore empty during the winter, little remains during the summer of the highly valued Sunday peace.

With reference to 2 – The construction of the dams in the Zandkreek (1960) and the Veerse Gat (1961) sealed off the water between the island of North and South Beveland and Walcheren from the sea. Since then it has been referred to as the Veerse Meer (Lake Veere). The water in this lake is still brackish at present; the salt content is about half that of the open sea.

Originally, the transformation into fresh water of all the waters behind the dams was regarded as one of the great secondary advantages of the Delta Plan. Agriculture, in particular, which is of great importance on the excellent marine clays of the islands of Zeeland and South Holland, would reap the benefits of this, as would water supply and industry. Because of shifts in the balancing of interests, however, a less black-and-white view is taken of this question.

In the first place, the stronger emphasis on the interests of nature conservation and the fisheries resulted in a completely new plan for sealing off the Eastern Scheldt. Now there are discussions about two of the Delta lakes sealed off by dams – the Grevelingen and Lake Veere. The first of these can be made completely salt or completely fresh, as desired. In both of the barrier dams (Brouwers and Grevelingen dams) there are openings which can be regulated, so that the lake can be flushed with either salt water from the west or fresh water from the east. Things are rather more difficult with Lake Veere. Now that the Eastern Scheldt is to remain salt, the lake cannot be flushed with fresh water, so that it can never become completely fresh. The question now is whether the lake must remain brackish or be made more saline for environmental reasons. If the latter course is chosen a controllable opening will also have to be made in the Veere Dam. Nature conservation interests, in particular, favour this course, but it is directly opposed to the interests of agriculture on the surrounding islands.

Meanwhile, the different forms of open air recreation have developed favourably on and around the 2.035 hectares of Lake Veere. Lengths of shoreline with artificial beaches have been laid out and provided with facilities, artificial islands have been created in shallow areas, marinas and camp sites have been laid out (photo XV), and these facilities are still being expanded.

Photograph XV – *Western part of Lake Veere, looking north. Left, above the centre of the photograph, the little town of Veere, in the background the Veere dam, in the foreground marinas and camp sites.*

B.3. – Zuyder Zee Works

Here again, abundant information is available elsewhere about this project as a whole (e.g. I D G Zuyder Zee/ Lake IJssel Guide; publications of the IJsselmeer Polders Development Authority).

Like the Delta Plan, the Zuyder Zee project has a long prehistory. Its implementation began in 1920 with the construction of a dam between North Holland and the island of Wieringen. Between 1927 and 1932 the Afsluitdijk (Barrier Dam) was built between Wieringen and the province of Friesland, thereby sealing off the Zuyder Zee from the Wadden and North Seas (since when it has been called IJsselmeer - Lake IJssel; fig. 17).

In conformity with the plans of Cornelis Lely four polders were reclaimed in this lake, as follows:

1927 - 30 – Wieringermeer	– 200 sq.km.
1937 - 42 – North East Polder	– 480 sq.km.
1950 - 57 – Eastern Flevoland	– 540 sq.km.
1959 - 68 – Southern Flevoland	– 430 sq.km.

According to the original plan a fifth polder, the Markerwaard, should by now have been in an advanced stage of reclamation, but this has not happened. There have already been several years of discussion about whether or not this polder should be reclaimed and, if it should, in what shape and size and for what purpose. The sudden hesitation in completing this grandiose project is puzzling to many foreigners and so we shall devote the remainder of this section to a consideration of it.

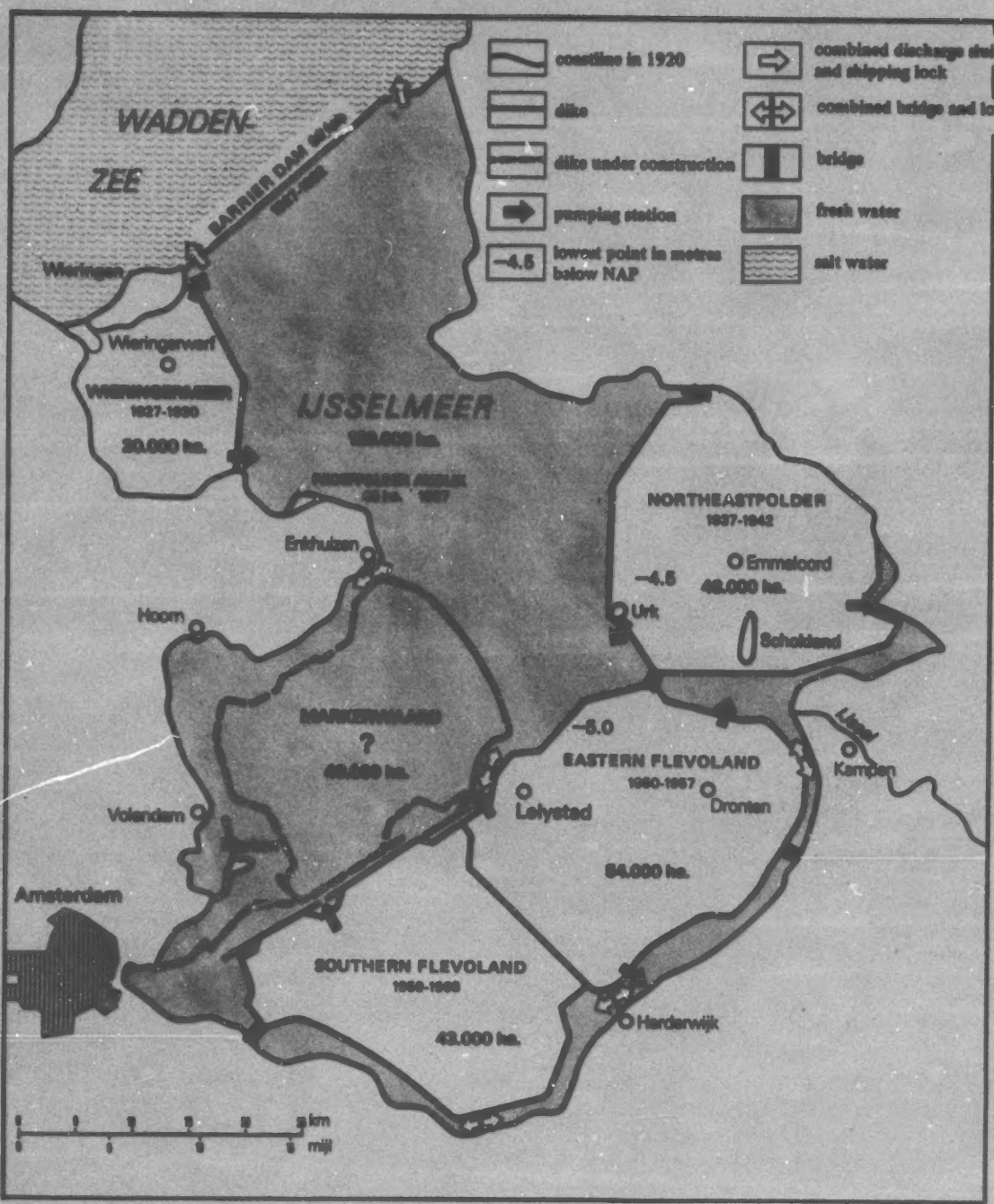


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fig. 16 – Zuyder Zee works

Markerwaard –yes or no ?

To those people who have followed closely the development of the Zuyder Zee project and the planning of the successive polders the hesitation in proceeding with the reclamation of the Markerwaard is not so very surprising or unexpected. The whole history of the planning of the polders shows a gradual evolution, characterised by increasing variety in the land uses of the polders and greater flexibility of planning.
The Wieringermeer was laid out almost exclusively for arable farming. The road and field patterns were – and still are – wholly subordinate to the needs of arable farming. The four villages were distributed with little thought over the polder; wood was planted only on an area of sandy soil in the north which was less suitable for agriculture.

In the North East Polder, too, the interests of farming prevail, but there are important differences:

- there is more variety in the agricultural land use;
- the central place and ten surrounding villages were carefully planned (although in a manner which later proved not to be the correct one);
- an industrial zone has also been created in the central place – Emmeloord;
- proportionately more woodland has been planted in the polder.

In Eastern Flevoland it became clear for the first time that the planning of the new polders is a supra-regional matter to be placed within the framework of the physical planning of the whole country. Although agriculture still forms the principal element, there are also such things as nature reserves and recreational facilities which attract people from far beyond the polder. Among the recreational facilities besides the woods, lakes and beaches (along the marginal lakes), there is a permanent national agricultural exhibition – the Flevohof.

The central city of Lelystad was conceived as a higher order service centre for the whole area of the Lake IJssel polders, but it also fulfils a clear function as a reception centre for the overspill of population from the northern wing of the Randstad, particularly Amsterdam. *)
There are also in the polder an electric power station, which is connected to the national grid, and a complex of fish ponds, which breeds fish for inland waters all over the country.

In Southern Flevoland, which is at present being laid out, all this is going one step further. The largest town in this polder, Almere, will be able to accommodate 250,000 people by the end of the century, most of whom will come from the Randstad. At present a large part of the polder has been or is being taken into agricultural use (exploitation by the state during the first years). The southern part is being laid out as woodland and for recreational use, while a large area of water in the northern part is being maintained as a nature reserve.

A summary of the distribution of land use in the four polders illustrates how in the later polders, the area of land for agricultural use is decreasing proportionately in favour of other forms of land use:

Land Use, Percentages	Wieringer-meer	North East Polder	Eastern Flevoland	Southern Flevoland
agricultural land	87	87	75	50
woods, nature reserves	3	5	11	25
residential, industrial	1	1	8	18
dikes, roads, water	9	7	6	7

Regarded in this light, the discussion about whether or not to reclaim the Markerwaard becomes more comprehensible. It is precisely in respect of those matters which have come increasingly to the fore during the planning of Eastern and Southern Flevoland that doubts have arisen through the developments of recent years.

*) Lelystad is designated in the Urbanisation Report as a growth centre, the population of which may increase to 100,000.

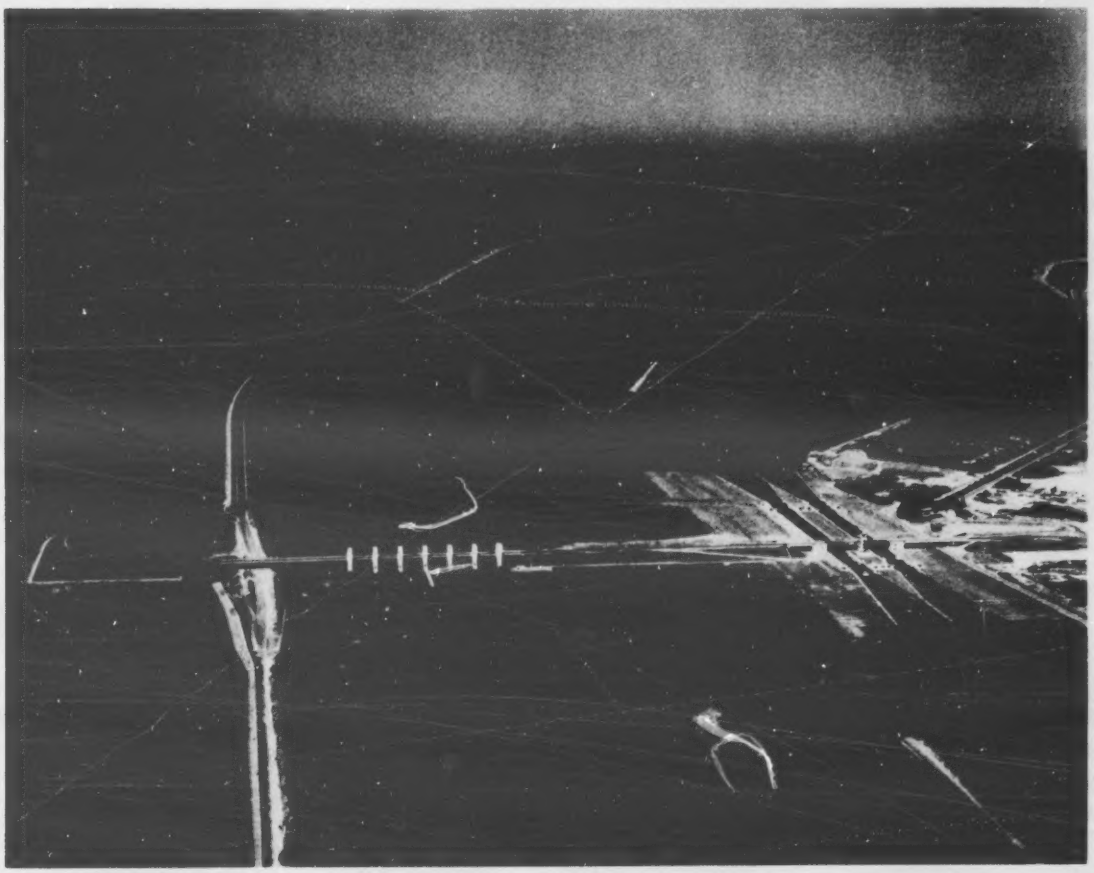
The Markerwaard would afford additional space for receiving population overspill from the Randstad, but now the rate of growth of the Dutch population has fallen considerably since about 1965. Moreover, government policy for population dispersal is no longer oriented so strongly towards the diversion of population growth in the West to areas situated outside the Randstad. In this context, therefore, the role of the Markerwaard is unclear.

In laying out the polder new areas could be created for open air recreation, both in the polder and on and along the marginal lakes. The counter-argument is that these areas are rather remote from the large population centres, which is in contradiction to the aim of reducing mobility, while, moreover, a large area would be lost for large-scale water-sports.

One of the first uses considered for the Markerwaard was that of a second national airport. At the end of the 1960's the Amsterdam airport of Schiphol threatened to become overloaded because of the continuing growth of air traffic. The changed views about energy consumption, which have emerged particularly since 1973, and the resultant changes in the growth of air traffic make it very doubtful that the Netherlands will ever need a second major airport. Moreover, other locations are possible.

This leaves as possible uses for the Markerwaard agriculture, horticulture and forestry. In view of the world food situation and the continual loss of Dutch farmland and woodland to urban uses, roads etc., consideration must be given to whether it is desirable to reclaim the Markerwaard.

This appears to close the circle in the history of the Zuyder Zee Works: the interests of agriculture, for which the first polder was used exclusively, will now perhaps also be decisive for the last polder, although the discussions about such matters as urbanisation, recreation and an airport have not yet ended.



Photograph XVI – *The Houtrib locks in the Oostvaardersdiep near Lelystad, looking north. Left, the discharge sluices, right, the shipping locks. In the background the dike to Enkhuizen; the area to the left would become land if it is decided to drain the Markerwaard.*

During the 1970s various government reports appeared about the Markerwaard. The report "Beschouwingen over de Markerwaard" (Speculations about the Markerwaard) was published in 1972. It contained six alternatives for a new polder (see, for example, the I D G Zuyder Zee/Lake IJssel Guide, pp. 43-45). In 1975 appeared the report "Verkenningen Markerwaard" (Markerwaard Explorations), followed in 1976 by "De Markerwaard, 't maken waard"? (Is the Markerwaard worth making?).
The shape of the Markerwaard shown in fig. 17 is taken from the 1975 report. It is a polder 40,000 hectares in extent, i.e. one third smaller than in the original plans, with consequently considerably wider marginal lakes remaining on the western side.
The Association for the Preservation of Lake IJssel, which was formed in 1972 by a group of perturbed citizens, points out that all these reports more or less tacitly take as a starting point the reclamation of the Markerwaard. Alternatives are given for the shape (1972) and the lay-out (1975), without – according to the Association – clearly demonstrating the necessity for reclamation.

The answer will have to be given in the next few years. The decision will have to pass through the full Key Planning Decision procedure (PKB – see, for example, I D G Bulletin, 1977-78, p. 44), which means opportunity for public participation at the national level.

The fact that the eastern dike of the Markerwaard, connecting Lelystad with Enkhuizen, was already completed in 1975, forms no argument in the discussion. Even without the Markerwaard this dike performs a function, i.e. that of separating the waters in the northern and southern parts of Lake IJssel (see I D G Zuyder Zee/Lake IJssel Guide, p. 14). Moreover, the road over the dike provides a considerably better link between the north of the province of North Holland and the centre of the country.

B.4. – Water as a structuring element in rural areas

For the farmers who began practising farming in the Low Netherlands in the past or in modern times water has always been an important factor in the structuring of the rural landscape.

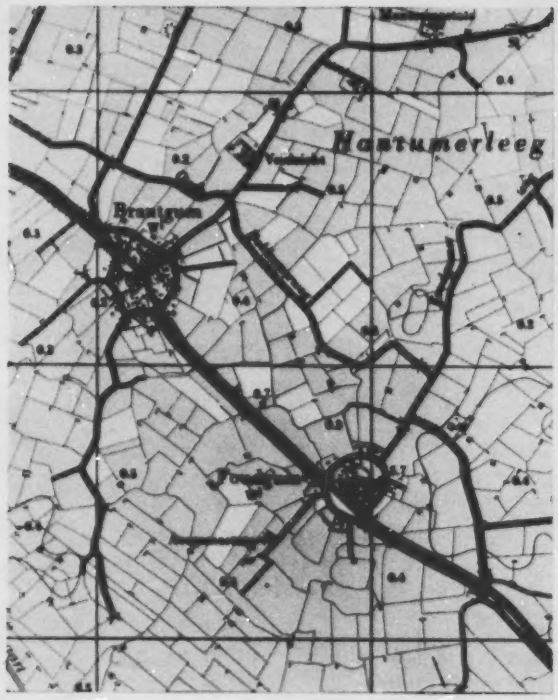
In the first place it influenced the form of settlement. The four extracts from topographic maps scale 1:25,000) in fig. 17 illustrate this. The villages in extract a. are "terp" (dwelling mound) villages in the north of Friesland, originating from a time when the farmland was flooded with great regularity. The construction of the "terpen" began before the beginning of the Christian era. Later, when the flood danger was reduced by the building of dikes in about the year 1000, farmsteads were also built outside the "terp" villages, close to their fields (although still often on small mounds).

The farmsteads on map b. were built along the dike of the River Lek (part of the lower course of the Rhine). This was not only for reasons of safety, but also on grounds of accessibility; the most passable roads to the surrounding districts were of old situated on the dikes.

Extract c. shows an area in the east of Drente, which originally consisted of peat bogs. In order to drain the bogs – initially with the aim of winning peat from them – straight drainage canals were dug, along which the peat could also be transported. In some of these areas the exploitation of peat began as early as the 16th century, but in the area illustrated not until the 19th century. Roads were constructed alongside the main canals and the farmsteads were built along these roads. In the area of the map there is a system of double canals, with the through roads situated on the piece of land between. The advantage of this is that the roads do not need to be carried on bridges over the numerous feeder canals.

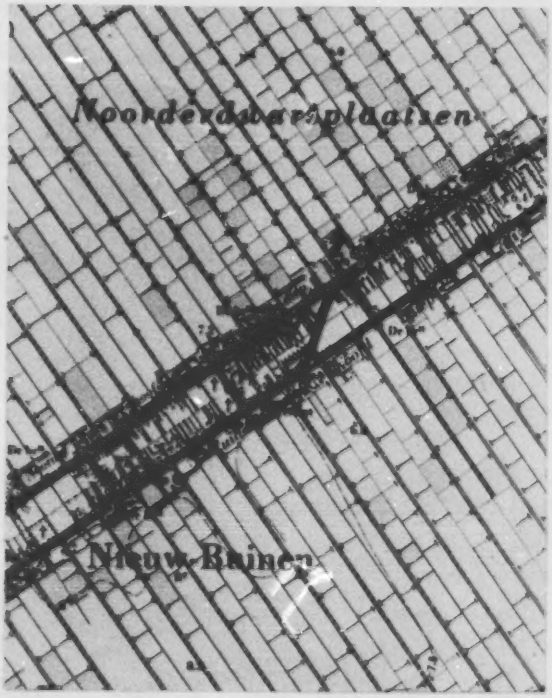
Lastly, figure 17d. shows part of Eastern Flevoland. Here the farms are not grouped in villages, but are all situated out in their fields. The villages perform a service function for the surrounding area. Because in this new polder no account has to be taken of the threat of floods and of differences in the swampiness of the ground, the water here has scarcely any influence on the pattern of farms and villages.

The water was also an important factor in the origin of the *parcellisation.*

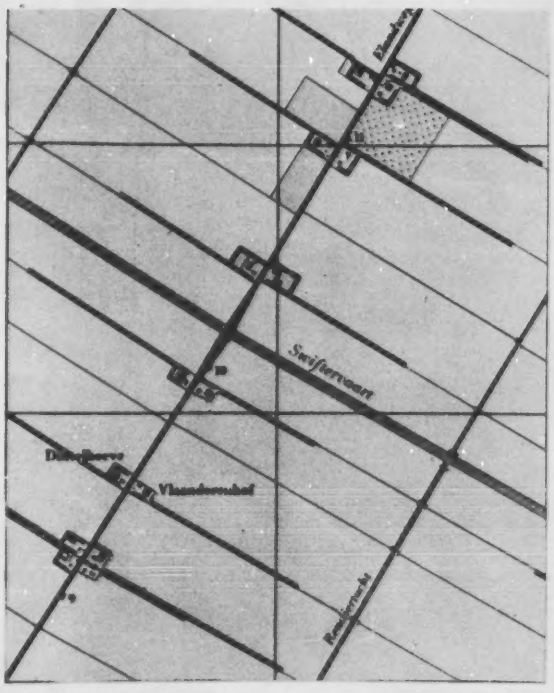


a – Friesland

b – region of great rivers



c – E. Drente



d – E. Flevoland

fig. 17 – settlement and field patterns, scale 1 : 25,000.

Map 17a –

the field divisions of this irregular pattern of rectangular parcels all consist of ditches. Some of them follow the course of old creeks, along which the sea flowed in and out with the movement of the tide before the building of the dikes.

Map 17b –

when the land in the western part of the region of the great rivers was taken into use in the Middle Ages, the divisions between the parcels (= ditches) were dug at right angles to the direction of the river. This pattern occurs in a great many variations in large parts of the country. Particularly in areas where often very narrow parcels have been created, as a result of later subdivision, the improvement of the possibilities for economically viable agriculture has become an urgent necessity (farm consolidation).

Map 17c –

in essence we see here, in the peat colonies, the same pattern as in the previous example. After the digging of peat had ended, the area was taken into use for arable farming. Because the area was laid out in a more recent past than that of example b, the pattern makes an even more rectilinear and regular impression. Each parcel and each dwelling is reached from the canal roads by means of a bridge.

Map 17d –

This landscape has been totally conceived on the drawing board. The dimensions of the standard parcels – here 300 x 1000 metres – were determined in response to the demands of modern farming practice. The front and back end of each parcel borders on the water, while ditches also form the divisions along the long sides of the parcels.

Polder landscape near Zegveld

The Zegveld polder and the village of the same name are situated in the extreme west of the province of Utrecht, about 25 km west of the city of Utrecht. The area forms part of the low peat region of Holland and Utrecht (and of the "Green Hart" of the Randstad).

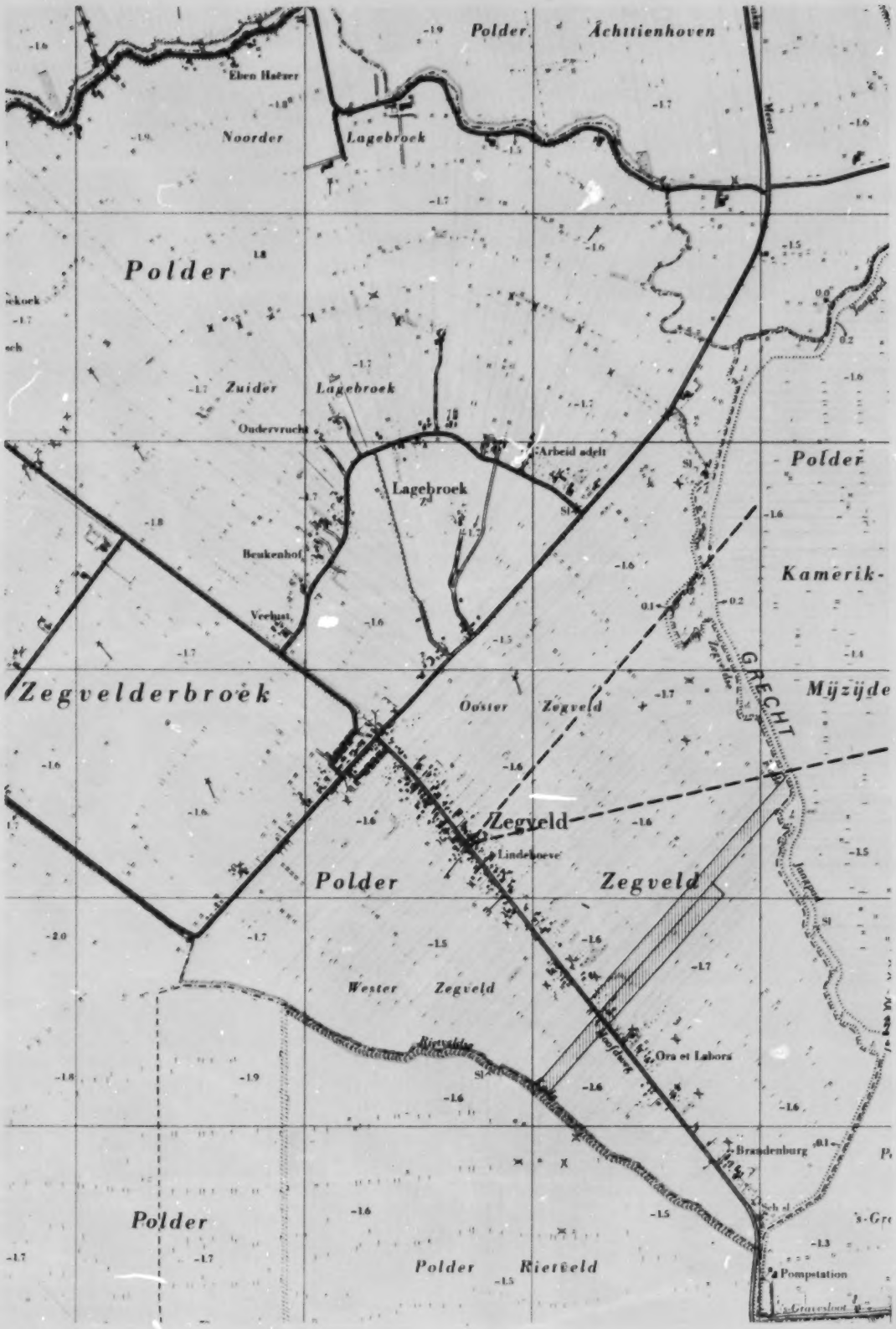
It is a characteristic example of the landscape created when the reclamation of these areas began around the year 1000. Before that time the settlements were situated mainly on the levees of the rivers, such as the Vecht and the Old Rhine. In the Middle Ages the peat areas were granted out for reclamation by the Counts of Holland or, in the case of Zegveld and its neighbourhood, by the Bishops of Utrecht.

Small rivers in the peat often formed the basis for the reclamation, which then took the usual form of extended, narrow parcels at right angles to the river, separated by narrow ditches. Where the basis is formed by a bend in the river the parcels often fan outwards, as in part of the Zegvelderbroek polder (see fig. 18, top half). In this polder, and perhaps also in the 500 ha. Zegveld polder (fig. 18, bottom polder), the farms situated more towards the centre of the polder were not built until a later stage.

The reason for placing the farms more centrally in the polder was a practical one: at a time when transport (mainly by water) was difficult, a central location on the greatly elongated parcels made farming easier. The farms in the Zegveld polder are all situated along the straight canal – dug for drainage and transport – along which first a footpath and later a road were constructed.

The family of Mr. C. A. de Bruijn works on one of the farms (shaded in fig. 18) in the Zegveld polder. It is a tenant farm, about 15 hectares in extent, and used wholly as grassland for cattle farming. It comprises two elongated parcels east of the road (the longest is 1250 metres long; the parcels are about 50 metres wide) and a shorter parcel west of the road. This western parcel has not always belonged to the farm. It was not bought by the owner of the farm until around 1930.

Up to about 1900, when the windmills were replaced by steam and electrically powered pumps, the water caused a lot of difficulty in the polder. The land was often marshy, which impeded the growth of the grass. The ditches and canals were important for transport.



= Mr. de Bruijn's farm

= boundary of photo. 17

fig. 18 – polder landscape in W of the province of Utrecht, scale 1 : 25,000.

47

Nowadays the ditches on and bounding the farm, like the canal, have hardly any importance for transport. For Mr. de Bruijn their function is to divide the parcels, as well as to subdivide the helding into, for example, pasture and hayfields, and they are indispensable for drainage. They discharge the water into the central canal, from which it is pumped into the Grecht and discharged via the Old Rhine into the sea. The polder level can now be accurately controlled.

All this means specifically for the farm of Mr. de Bruijn:

- that the owner must pay some 1700 guilders in drainage rates annually to Woerden Drainage District (position in 1979);
- that the tenant must ensure that the ditches are kept clean and not allowed to silt up and that his cattle do not damage the dike along the Grecht.

Twice a year officials of the drainage authority hold an inspection and, if necessary, prompt the tenant or owner to action.

Photograph XVII – *Polder landscape near Zegveld.*

The cows are most often grazed in the parcels situated close to the farmstead; the parcels "at the back" are used mainly for hay. As a result the banks of the ditches close to the farm are the most trodden by cattle, so that this is where the sides of the ditches have most often to be repaired and the ditches dredged. This is also where silt from the ditches is used regularly to raise the level of and strengthen the marshy land somewhat. In consequence the ditches here are considerably wider – often over 10 metres – than in the backlands.

The water level in the ditches is about two metres lower than that of the "boezem" water, the Grecht. The polder is situated about 1.60 metres below NAP.

This situation has arisen during the course of the centuries as a result of shrinkage of the soil, caused by pumping and a fall in the level of the groundwater, and by oxidation of the constituents of the peat. Originally, the river and the surrounding land were situated at about the same level.

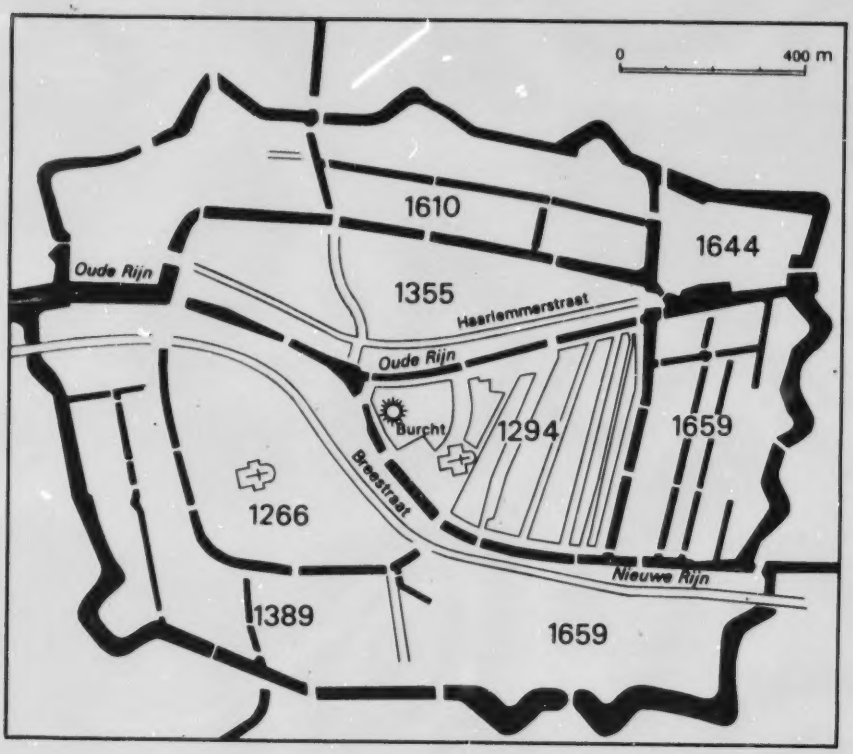
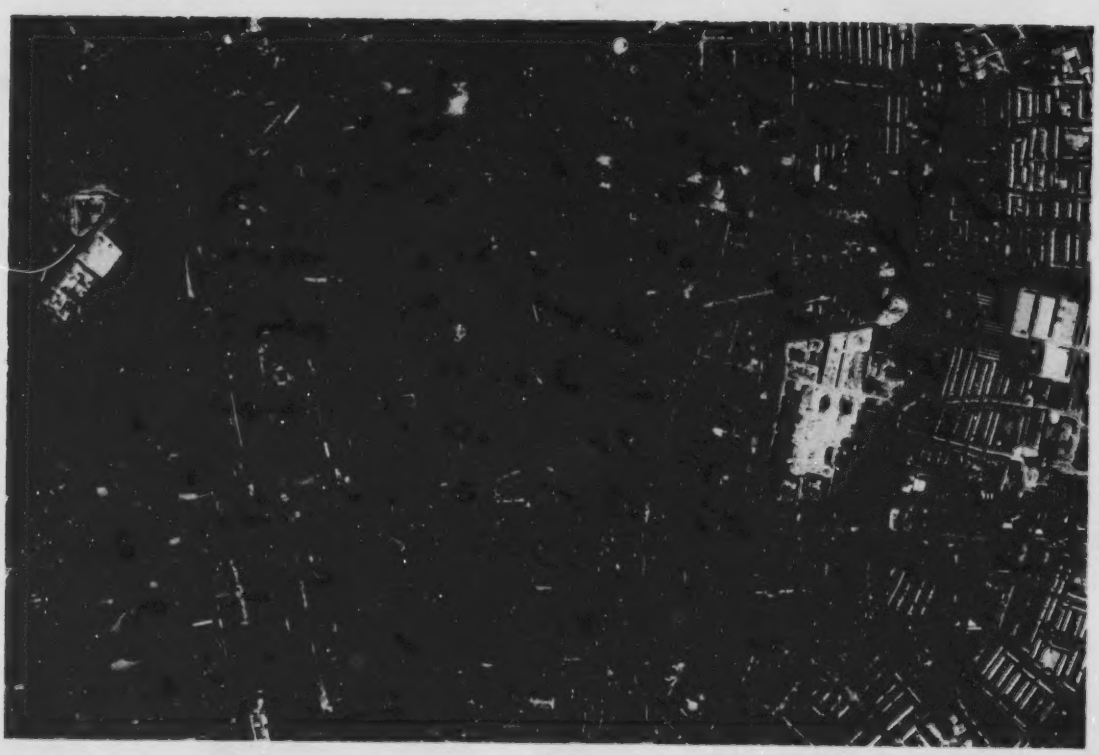


fig. 19 – growth of the inner town of Leiden.



Photograph XVIII – *The centre of Leiden, surrounded by moats, with the circular citadel at the core.*

B.5. – Water and Town Planning

Many towns in the Netherlands arose on rivers. Where the river is a large one, the town is situated on the water, such as Arnhem on the Rhine, Nijmegen on the Waal, Deventer and Kampen on the IJssel, Maastricht on the Meuse. Only in the recent past did the inhabitants venture the "leap to the other side" in expansing their towns. Smaller rivers flow *through* the towns, such as the Amstel through Amsterdam, the Rotte through Rotterdam, the Old Rhine through Utrecht and Leiden, the Spaarne through Haarlem and the Zaan through Zaandam.

Water occupies an important place in the townscape, particularly in the towns of the Low Netherlands. The water fulfils various functions in them. The rivers served of old as a means of transport and a sewer. In earlier centuries canal girdles and moats were dug to protect the towns. Moreover, where the towns are situated in polders the surface water system is important for storing and carrying away the excess water. In town planning water is also important aesthetically: ponds and other areas of water, with their attendant flora and fauna, enliven the townscape and sometimes invite various forms of open air recreation. Lastly, water in the towns can also provide living space: numerous houseboats in the towns of the Low Netherlands afford accommodation for many people.

In considering the importance of water for town planning in the Netherlands many think particularly of the old towns of "Holland". The concentric canal girdles of Amsterdam are famous, as are, for instance, the canals of Delft and Leiden (used below as an example), or the star-shaped defensive moats of Naarden or Willemstad. But in recent town planning also the surface water is an important factor, which is why Zoetermeer has been chosen as a further example.

Leiden

This old Dutch city is situated on the Old Rhine, the river which discharged the greatest volume of Rhine water to the sea at the beginning of the Christian era and formed the northern frontier of the Roman Empire in these parts. The place became important in the 12th century when the Count of Holland built a defensive castle at the point where two arms of the Rhine join (see fig. 19 and photo XVIII). From here the east-west water transport and the north-south land traffic crossing it could be controlled. The Breestraat and the Haarlemmerstraat were built along the dikes of the New and the Old Rhine, respectively. Thus in the oldest part of the city the street pattern was determined by the courses of these two rivers.

In the Middle Ages the town prospered greatly, thanks mainly to the overseas cloth trade (wool), with the Baltic countries, among others. The city was extended regularly during the period from the 13th to 17th centuries – see the years shown on fig. 19. The canals in these new quarters sometimes follow the courses of the former polder ditches, as in the most easterly extension (1659). One can recognise here the pattern of parallel ditches at right angles to the river, as described in Section B.4 (p. 43).

Developments in the technique of warfare made it necessary to build increasingly extensive defensive works around the city. The girdle of moats and bulwards completed during the 17th century is still clearly apparent as the boundary of the old city; the ramparts and bulwarks have largely given way to parks and gardens. At two points – in the west and the north-east – the old city gates are still present.

Zoetermeer

The village of Zoetermeer is situated about 15 kilometres east of The Hague in the "Green Heart" of the Randstad. In 1962 it was allotted the task of helping to relieve the spatial needs of the agglomeration of The Hague. The new town of Zoetermeer will ultimately have a population of about 100,000; at the moment it is well past the 50,000 mark.

Zoetermeer is situated in a polder region which, because of the removal of thick layers of peat in earlier centuries, lies at about 4 to 5 metres below sea level. Only on the far left of fig. 20 is something still recognisable of the original parcellisation pattern in the trend of the lakes, some of the roads and the sports ground laid out along them.

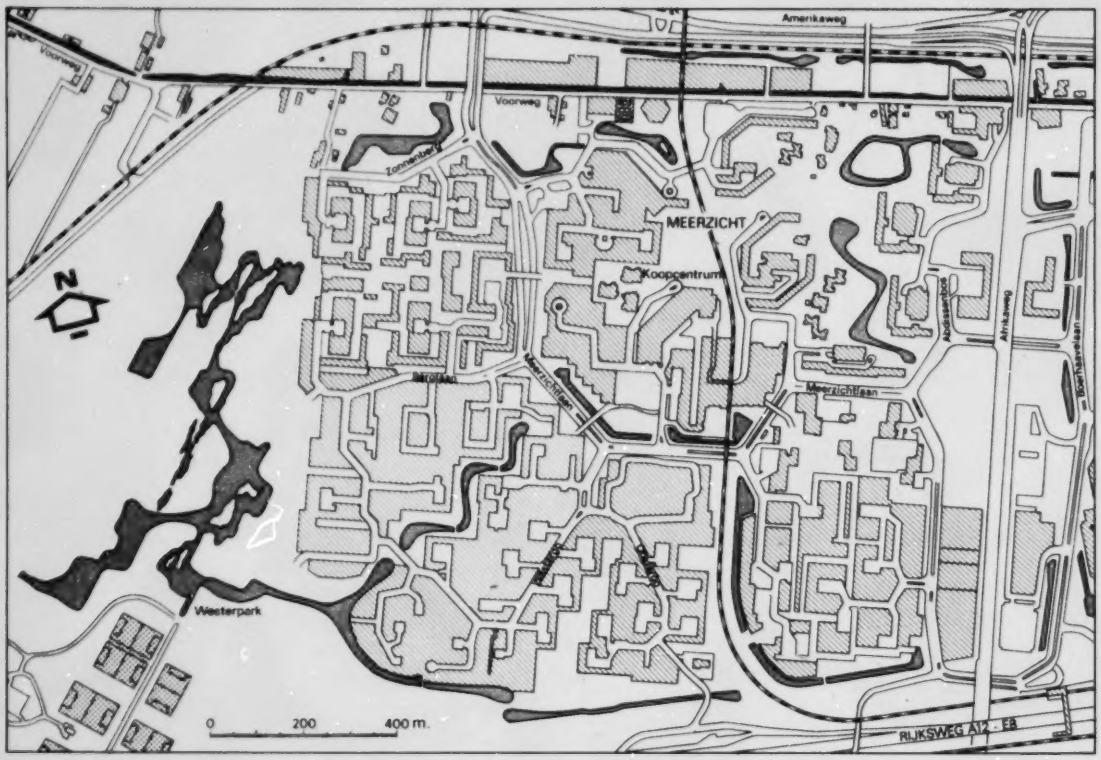


fig. 20 – Meerzicht residential area in Zoetermeer.

Surface water plays an important part in the large-scale extension plans made to accommodate the rapid population growth (see fig. 20). The most important reason for this is the hard necessity that, in every settlement located in a polder, from 3 to 10% of the surface *must* consist of water. This area of water, which is necessary for storing and discharging excess water, has to be proportionately larger in a village or a town than in a rural area, because there are many more hard surfaces in a town (streets, roofs, etc.), from which the rainwater flows off rapidly to the sewers and areas of open water.

In order to prevent Zoetermeer becoming submerged after every heavy rain shower, the starting point for the lay-out of the residential areas was that 4% of the area should consist of open water. In addition, in the west and north of the town two large lakes have been created by the removal of sand. These function as an intermediate "boezem" (cf. Section B.1.; the Zoetermeer polders belong to the Rijnland drainage district) and are being laid out as recreational areas.

Zoetermeer has a separate sewerage system, which means that only the precipitation water is discharged to the open water. The sewage effluent of the town is pumped to a sewage treatment works in The Hague.

Photo XX shows that, in the residential neighbourhoods of Zoetermeer, thankful use has been made of the opportunity of creating an attractive dwelling environment with the aid of water.

Photograph XIX – *Delftsewallenwetering in Zoetermeer. In the polder behind, which lies several metres lower, the local railway (to The Hague) and development in the new town of Zoetermeer.*

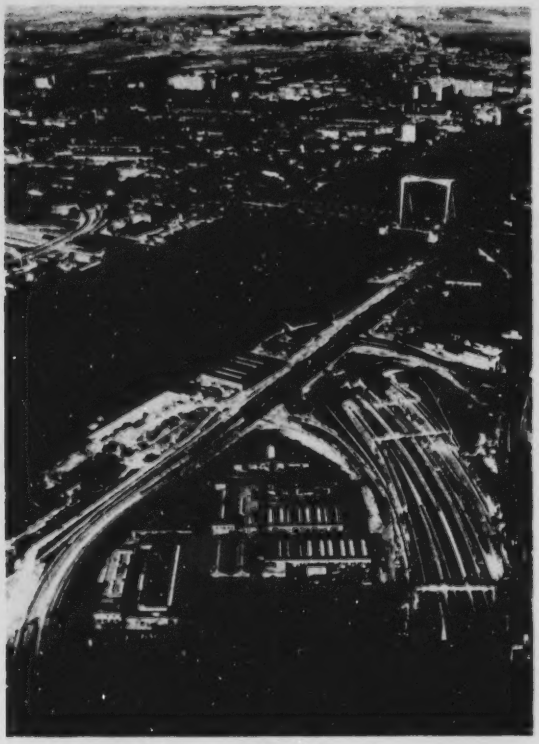
Photograph XX – *Houses on the water in one of the residential districts of Zoetermeer.*

B.6. – Obstacles to Land Traffic

The numerous large and small water courses in the Dutch landscape form as many obstacles to land traffic. The building of the Dutch rail network, in particular, which took place mainly between about 1840 and 1890, and the succeeding development of road traffic were greatly hindered by the dense network of waterways. Ferries, initially a much-used solution for road transport, cause too much delay to modern motor traffic. There are still a number of them in use – particularly in secondary road links – but where possible, they have been or are being replaced by permanent crossings. The latter are usually bridges, although the number of tunnels is steadily increasing.

The techniques used in the construction of these engineering works often require special adaptations to the local physical conditions. A bridge crossing an important navigable channel must leave sufficient clearance for shipping. In the generally flat Dutch landscape this means that the bridge must be built many metres higher than the surrounding landscape (see photo XXII). The approach roads to the bridge must therefore also be high, which causes great problems – and high costs – because of the generally weak sub-soil.

When tunnels are built they cannot, as in many other countries, be bored through the rocks under the river, since the bed consists to a great depth of soft material, usually clay or sand. The tunnel is therefore constructed in sections at a cental site in the dry and then floated a piece at a time to its destination and sunk there. For the construction of the metro in Rotterdam a temporary canal was even dug for it through the centre of the city.



Photograph XXI – *Road tunnel under, road and rail bridge over the Old Meuse at Dordrecht, looking north.*

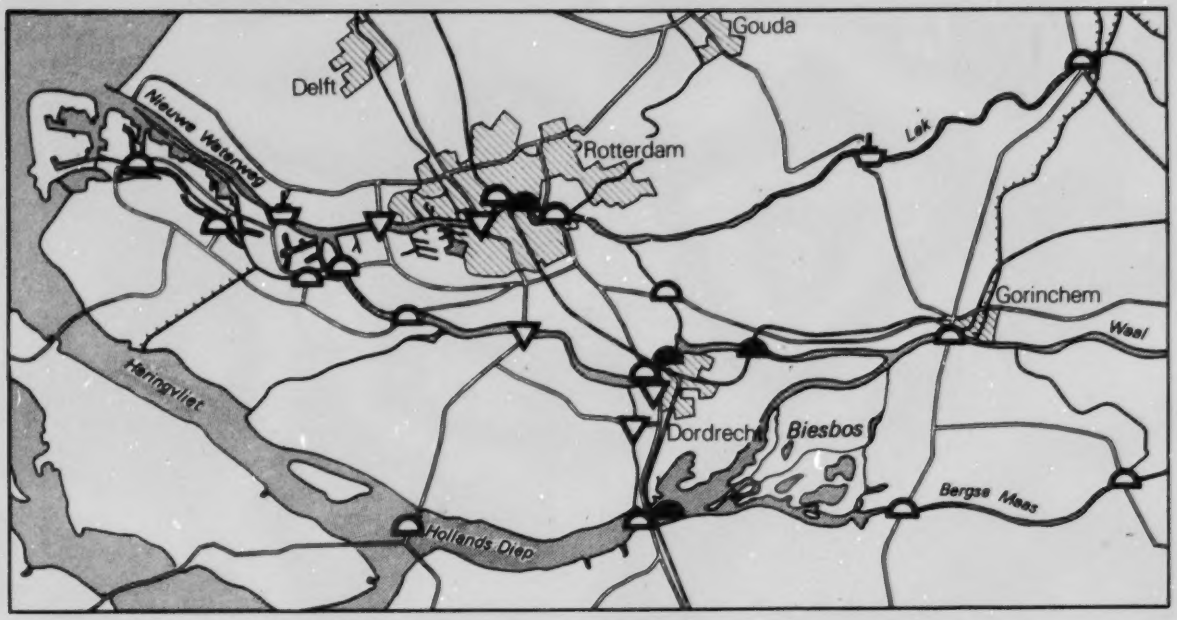
Photograph XXII – *The Van Brienenoord Birdge east of Rotterdam, literally rising up as tall as houses above the surroundings.*

The greatest concentration of fixed crossings is obviously to be found in the region of the great rivers, roughly speaking between Arnhem/Nijmegen in the east and Rotterdam in the west. Fig. 21 gives an overview of the situation. The region of the great rivers has historically been a dividing element in the Netherlands and is still experienced as such by many inhabitants, for example, of the provinces of North Brabant and Limburg: "above the great rivers" another world begins.

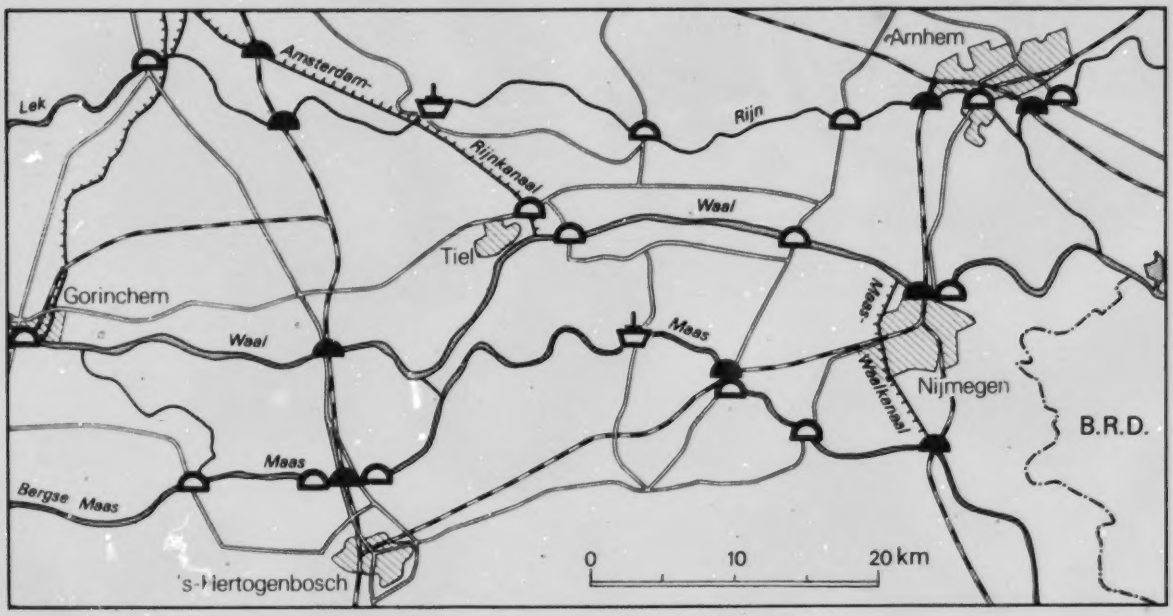
A special case is the archipelago of the South West Netherlands, which has only now been released from its isolation, thanks to the Delta Plan and its associated works (see also the comments about the Western Scheldt crossing in Chapter III, "Brief Notes", p. 62).Here is also to be found the longest bridge in the Netherlands: the 5-kilometre long Zeeland Bridge.
An example of a bridge with an eventful history is the road bridge over the Hollands Diep south of Dordrecht: the Moerdijk Bridge. For centuries the 1 1/2 kilometre-wide Holland Diep formed a serious obstacle to traffic between, for example, Rotterdam/Dordrecht in the north and Breda/Antwerp in the south. The first important improvement was the completion of the 1400 metre-long railway bridge in 1872, but road traffic had to continue using the ferry until 1936, when the road bridge was opened.

Well before the bridge's tenth anniversary could be celebrated the German troops blew it up in the course of their retreat in 1944. After a temporary repair with parts of the railway bridge, which had also been partly destroyed, the bridge could be used again in 1945. The railway bridge was also temporarily repaired, later completely renewed and made suitable for double track. In 1946 the road bridge was restored to its pre-war form.

Because of the explosive growth of road traffic, however, the pre-war dimensions proved to be inadequate after a few decades. The number of cars using the bridge increased from 5,200 in 1950 to 38,000 in 1973. It was therefore decided to replace the bridge by a wide, completely new structure. The width was increased from 19 to 43 metres, while still making use of the original piers. This was possible because the new bridge, without a high superstructure, is wider, but not heavier than the original bridge. The new bridge has three lanes of 3.5 metres, a central reservation and a cycle track in each direction.



a – western section of region of the great rivers



b – eastern section of region of the great rivers

= rivers
= canals
= roads
= railways

= road bridges
= road tunnels
= railway bridges
= vehicle ferries

fig. 21 – river crossings in the region of the great rivers.

Photograph XXIII – *Towing the first new section of the Moerdijk Bridge into position, 1976.*

Photograph XXIV – *The completely renewed road bridge over the Hollands Diep at Moerdijk, looking north. Right, part of a rail bridge, a link in the connection between Rotterdam and Antwerp etc.*

The replacement of the old by the new bridge took place in ten stages in the years 1976-77. At each stage, during an approximately 24-hour operation, an old bridge section was removed and a new section floated in (see photo XXIII). The old sections were not scrapped, but used to improve two other bridges, which had become too narrow in their turn. Four sections now form a new bridge over the Old Maas between Hoogvliet and Spijkenisse in the south west of the Rotterdam agglomeration. The six other sections, in two parallel rows of three, form a new crossing over the Bergse Maas on the Utrecht-Breda Motorway.

C – Water Engineering Works Abroad

A call is often made upon the experience and skill of Dutch firms and experts for the design and execution of water engineering works in other countries. As early as the 17th century Adriaan Leeghwater, who had successfully drained the great lakes in North Holland, had to assist with the execution of drainage works in England, France, Germany and Denmark.

There follows a list of recent examples of water engineering works abroad where use is being made of Dutch skill and knowledge:

– Honduras:	extension of part of San Lorenzo
– Colombia:	control of the Rio Magdalena
– Curaçao:	water supply
– United Kingdom:	building of dams and tidal power stations in the Severn estuary
– Algeria:	harbour works in connection with export of LNG at Port Central E of Algiers
– Nigeria:	prevention of bank erosion of rivers Qua Ibo and Imo to protect the towns along the banks
– Togo:	prevention of floods through construction of a surface water sewerage system (Lome lagoon)
– Egypt:	land reclamation at Port Said
– Iran:	construction of three fishing harbours
– Iraq:	irrigation and the combatting of salination in the Euphrates and Tigris valley
– Bangladesh:	water control and land reclamation in S.W. of the country
– Thailand:	extension of port of Klongtoi
– Burma:	deepening of navigation channel in Rangoon estuary
– Indonesia:	making marshy coastal areas habitable on the islands of Sumatra and Kalimantan etc. restoring Buddhist temple of Borobudur on Java (*inter alia* by providing for drainage of rainwater)
– Senegal:	water supply and sewerage system in Dakar.

The Dutch contribution to these and other projects sometimes consists only in carrying out preparatory studies and making reports. In other instances the work is carried out under the direction of Dutch firms. An important part is played in this connection by the Foundation of the Netherlands Engineering Consultants, NEDECO (The Hague).

The Hydraulics Laboratory (Waterloopkundig Laboratorium, WL) plays an important part in the preparatory studies for water engineering works in the Netherlands and broad. This research centre was opened in 1927, the year which saw the beginning of the building of the Afsluitdijk (Zuyder Zee enclosing dam) and the draining of the Wieringermeer, in other words, the beginning of an era of great water engineering projects.

The WL is an independent foundation with a staff of over 600. Both the government – its biggest client is the Ministry of Transport and Water Affairs – and private firms make use of its services. Contracts with foreign countries account for about one-fifth of its turnover. The Laboratory comprises a complex of buildings in Delft and, since 1952, a laboratory in the North East Polder. At both sites scale models of river mouths, estuaries, lock complxes etc. can be built in order to carry out tests and measurements. In the North East Polder they can also be built in the open air.

Photo XXV shows as an example the 1 in 100 scale model of the extension to the port of Annaba in Algeria (fig. 22). The Hydraulics Laboratory used this model to carry out tests to determine, among other things, the optimum length of mole needed to reduce wave action in the harbour.

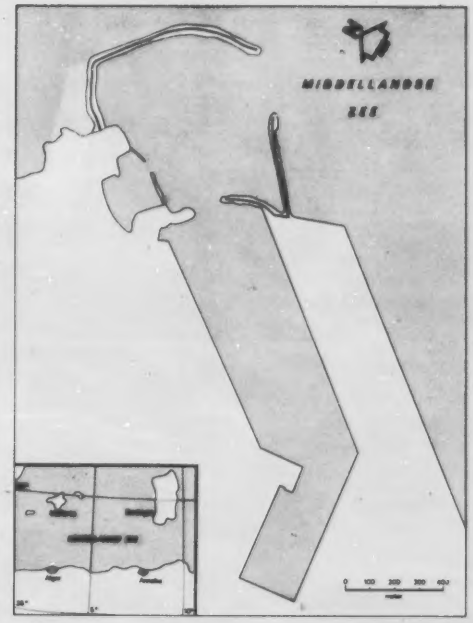
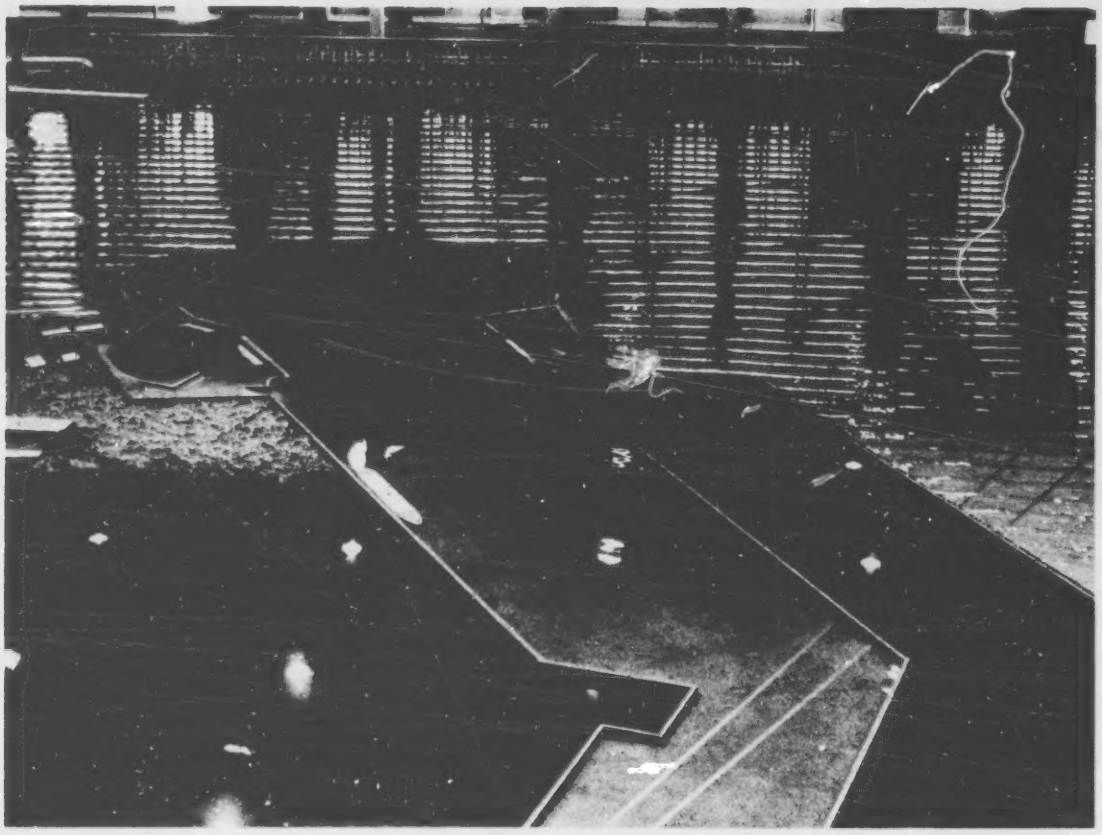


fig. 22 – Annaba port project in Algeria.



Photograph XXV – *A scale model of the port of Annaba in one of the halls of the Hydrological Laboratory at Delft.*

II. – STATISTICS

Two criteria were used in making the selection of statistics published in this Bulletin. Firstly, statistics are included each year which are subject to rapid changes or which experience has shown to be constantly used in foreign geography teaching about the Netherlands. This also provides the possibility of making comparisons with previous years in respect of these data.
Secondly, with regard to the less frequently used or less rapidly changing statistics, the main aim has been variety, so that during the course of the years a number of different themes are dealt with. Lastly, the anual leading article generally gives quite detailed statistics about the subject under review.
The sources for the statistics given in this chapter are mainly two recent publications of the Central Bureau for Statistics (see also literature list at the back of this Bulletin).

- Statistisch Zakboek 1978 (Pocket Yearbook 1978)
- Bevolking der gemeenten van Nederland op 1 januari 1978 (Population of the municipalities of the Netherlands at 1st January 1978).

These publications generally give figures for 1st January 1978 or for the year 1977. In addition some figures were received directly from the C.B.S. relating to one year later.

Area and land use

For the area of the Netherlands on 1st January 1979 the C.B.S. gives the following figures:

a –	land area (i.e. exc. waters wider than 6 m.)	33,913 sq.km.
b –	total area incorporated into municipalities	36,933 sq.km.
c –	total territorial area of the Netherlands (i.e. inc. estuaries, territorial waters etc.)	41,160 sq.km.

It is usual to take the figure given under b as the area of the Netherlands; for the calculation of population density per square kilometre (land), however, the figure under a is used.
The division over the different forms of land use is as follows:

	sq.km. 1st January 1979
cultivated land	24870
woodland	3110
natural areas	1600
other land (towns, roads etc.)	4334
waters wider than 6 m.	3019

Since the last major polder (Southern Flevoland) was drained in 1968 the total area of the Netherlands has remained almost unchanged, but this does not apply to the breakdown of land use. A comparison of the situation at 1st January 1979 with that on 1st January 1976 shows the following changes:

cultivated land	– 1,0 %
woodland	+ 0,7 %
natural areas (heaths, dunes etc.)	– 2,9 %
other lands (towns, roads etc.)	+ 9,4 %
waters wider than 6 m.	– 3,8 %

Land use for building, roads etc. has increased, i.e. by 372 sq.km. mainly at the expense of the area of cultivated land (by 243 sq.km.), the waters and the natural areas.

Population

At about the beginning of March 1979 the population of the Netherlands passed 14 millions. Since 1900, when the country had something over 5 million inhabitants, the population has grown as follows:

1911	– 6 million	1941	– 9 million	1963	– 12 million
1922	– 7 million	1949	– 10 million	1970	– 13 million
1931	– 8 million	1957	– 11 million	1979	– 14 million

It will be seen that the rate of growth slowed down during the 1970's. The twelfth million was reached in a period of six years, the thirteenth in seven years, while nine years was required for the fourteenth.
The maximum and minium C.B.S. projections for the year 2000 are 15.2 and 14.3 millions, respectively. With the latter estimate the figure of 15 million will not be reached, because the population is expected to start to decline before that date.
The population trends in 1978 were as follows:

Key Demographic Indices (per 1000 population)	**1978**	
Birt rate	12,6	
Death rate	8,2	
natural increase		4,4
Immigration	6,4	
Emigration	4,4	
net migration		2,0
Total population growth		6,4

fig. 23 – regions, provinces, and municipalities with over 100,000 inhabitants (1-1-1978).

The table below gives for the provinces and regions (fig. 23) the land area at 1st January 1979, the population and population density at 1st January 1979 and the growth from 1st January 1974 to 1979.

	land area km 2*	Population x 1000	No. of inhabs per km 2 of land	% growth 1-1-1974
	1-1-1979	1-1-1979	1-1-1979	to 1979
Groningen	2338	551	236	+ 3,4
Friesland	3353	578	172	+ 5,6
Drente	2654	416	157	+ 5,6
North Netherlands	**8345**	**1545**	**185**	**+ 4,8**
Overijssel	3814	1010	265	+ 4,4
Gelderland	5008	1681	336	+ 5,0
S. Lake IJssel Polders	972	59	61	+ 136,0
East Netherlands	**9794**	**2749**	**281**	**+ 6,0**
Utrecht	1332	886	665	+ 4,4
North Holland	2667	2299	862	+ 0,7
South Holland	2907	3064	1054	+ 1,5
West Netherlands	**6906**	**6249**	**905**	**+ 1,6**
Zeeland	1790	344	192	+ 6,5
East Netherlands	**1790**	**344**	**192**	**+ 6,5**
North Brabant	4912	2031	413	+ 6,3
Limburg	2166	1065	492	+ 2,6
South Netherlands	**7078**	**3096**	**437**	**+ 5,0**
NETHERLANDS **	**33913**	**13986**	**412**	**+ 3,7**

*) area excl. waters wider than 6 metres.
**) population of the Netherlands including persons without a fixed address entered in the Central Population Register.

In most instances the population of the towns continued to decline. A comparison of the figures for 1st January 1979 with those of five and ten years previously gives the following picture:

Population x 1000	1-1-1969	1-1-1974	1-1-1979
Amsterdam	845,8	770,8	718,6
Rotterdam	699,2	635,9	582,4
Den Haag	563,6	494,7	458,2
Utrecht	276,3	263,6	236,1
Eindhoven	187,2	191,8	192,7
Haarlem	172,9	168,2	159,7
Groningen	167,7	166,8	160,6
Tilburg	151,2	152,5	150,8
Nijmegen	147,2	148,2	147,7
Enschede	136,9	142,1	141,9
Apeldoorn	120,9	130,7	137,2
Zaanstad	60,6	124,9	127,7
Arnhem	134,3	127,7	127,0
Breda	120,0	119,2	117,5
Maastricht	94,6	111,6	109,3
Dordrecht	88,1	101,3	106,1
Leiden	102,5	96,8	102,7
Hilversum	100,4	95,0	93,4

On 1st January 1976 over 350,000 foreigners were living in the Netherlands. The largest groups came from the neighbouring countries and from the Mediterranean region:

foreigners x 1000 originating from:	1-1-1976
Turkey	76,5
Morocco	42,2
German Federal Republic	41,0
Spain	29,1
United Kingdom	23,7
Belgium	21,5
Italy	20,0
Yugoslavia	13,8
other countries	82,7
TOTAL	350,5

Economy

The division of the economically active population in 1977 and 1978 was as follows (annual averages in man-years):

% economically active population	1977	1978
agriculture and fisheries	5,9	5,8
mining, quarrying and manufacturing	31,0	30,4
trade, traffic and other services	58,6	59,3
unemployed	4,5	4,5

The percentage unemployed shows considerable regional variation (see fig. 24).

fig. 24 – male unemployment per COROP region as percentage of the dependent economically active population, 30 June 1979.
(Source: Ministry of Social Affairs)

The division of the national income over the different sectors of the economy in 1977 and 1978 was as follows:

National income in %	1977	1978
agriculture and fisheries	4,6	4,5
mining, quarrying and manufacturing	37,6	37,6
trade, traffic and other services	57,5	57,9
abroad	0,3	0,0

In foreign trade in 1978, *imports* amounted to 114,372 million guilders (approx. 8230 gld. per head of population) and *exports* to 108,206 million guilders (approx. 7780 gld per head of population).

Nature of the commodities imported and exported:

1978, in %

IMPORTS		EXPORTS		
Raw materials and semi-manufactures	61	Unprocessed agricultural products	8	
consumer goods	19	minerals	7	
capital goods	14	Manufactures total	83	
other goods	7	of which:		
		food, drink and tabacco		18
		textiles, clothing		4
		petroleum products		10
		chemicals		18
		metal goods		27
		other manufactures		6

The countries with which The Netherlands traded in 1978:

Countries, 1978, in %	Imports	Exports
West Germany	25	31
Belgium & Luxembourg	13	15
France	8	11
United Kingdom	7	7
Italy	4	5
Other EEC partners	1	2
EEC total	57	71
U.S.A.	9	3
Other countries	34	26

If you do not find the statistics you require for educational or other purposes included among the limited selection given here, you may ask for them at any time from the I D G.

III. – BRIEF NOTES

1. Traffic

Schiphol Line

On 21st December 1978 a new railway came into use, the importance of which is not to be measured against the length (9 Km), but by significance of the places which it connects: Amsterdam and the airport of Schiphol. This means a rail connection between an agglomeration of nearly 1 million inhabitants and an airport employing 24,000 people and where some 9.5 million passengers arrive and depart annually (1978).

The Schiphol line is only the beginning of a new line 55 kilometres long between Amsterdam and The Hague. The old connection between the two cities – the oldest railway in the Netherlands (1829-1845) – was constructed when the Haarlemmermeer was still a real lake. This line runs via Haarlem and is 63 Km. long (fig. 25).

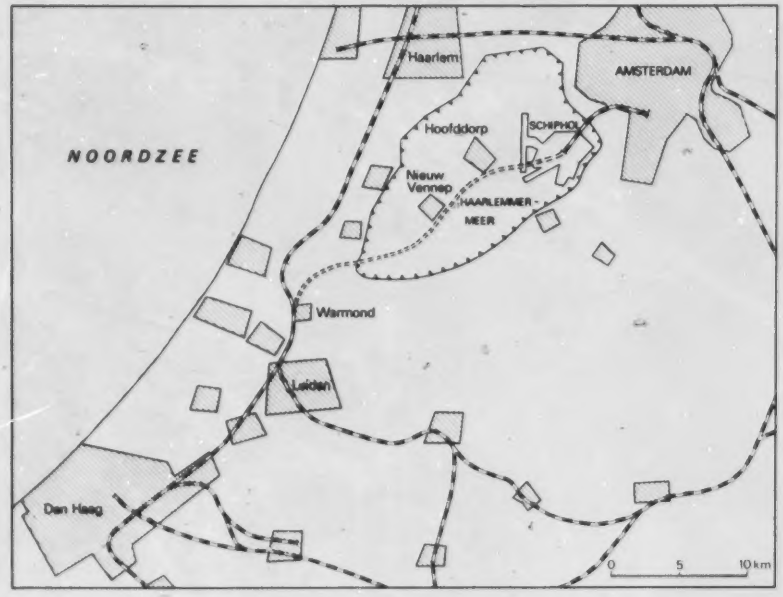


fig. 25 – railway connections between Amsterdam and The Hague.

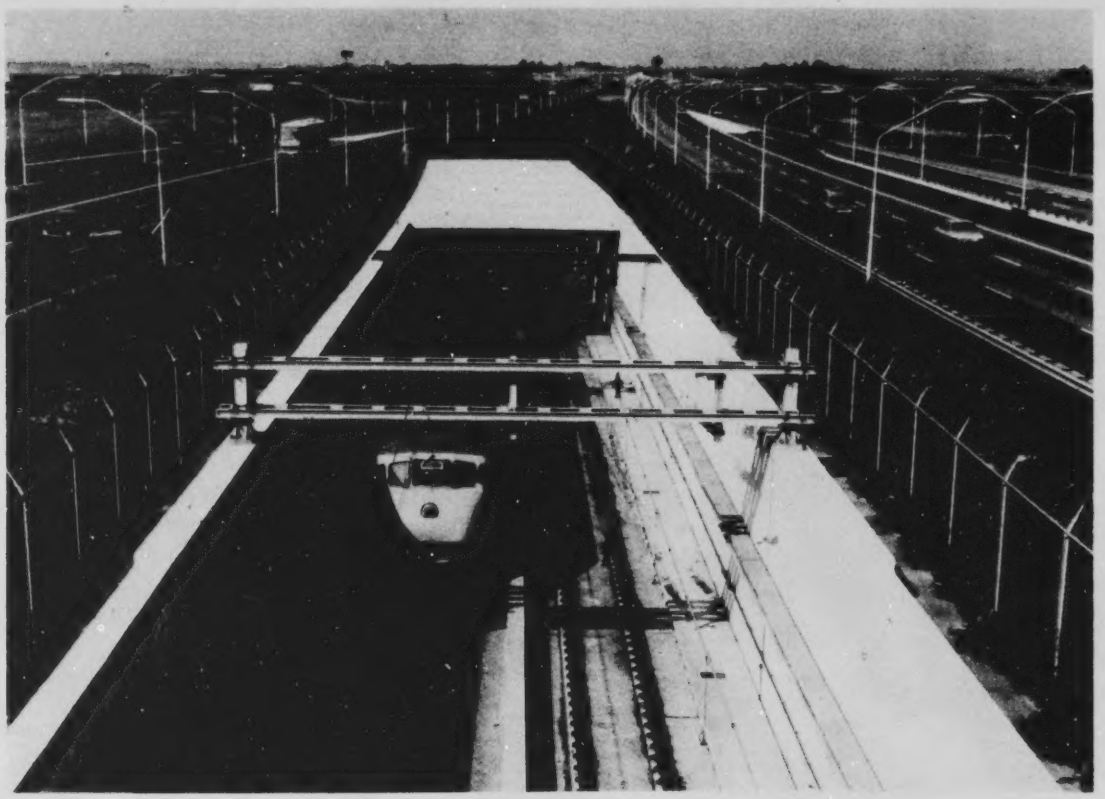
In Amsterdam the new line will be extended from its present terminus in Amsterdam South (probably) through the western sector of the city to Amsterdam Central Station.

South of Schiphol the line will pass the villages of Hoofddorp, Nieuw Vennep and Warmond and join the "old line" north of Leiden. This section may be ready in 1981, but it is not yet possible to say when the extension to Amsterdam Central will be completed.

Permanent river crossing of the Western Scheldt

To the delight of the inhabitants of Zeeland Flanders – the most south-westerly portion of the Netherlands – the government gave the "green light" in 1979 for the building of the permanent river crossing between Zeeland Flanders and South Beveland (fig. 26).

Thanks to the construction of dams and bridges the traffic situation in the Delta region has been considerably improved in recent years. The isolation of Zeeland Flanders on the far side of the broad Western Scheldt was therefore felt all the more strongly. Two ferry connections do exist, but if these are out of operation during bad weather, Zeeland Flanders is connected with the rest of the Netherlands only by way of the tunnel at Antwerp.



Photograph XXVI – *Schiphol Line, at the point where the rails come above ground in the central reservation of the Hague – Amsterdam motorway, NE of the airport.*

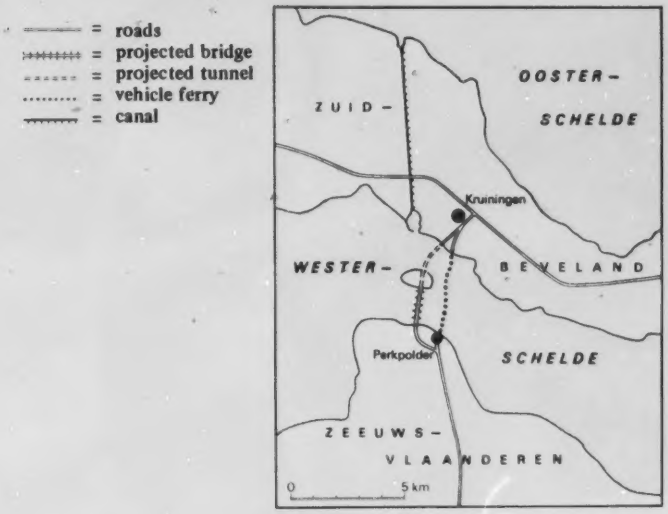


fig. 26 – Western Scheldt crossings.

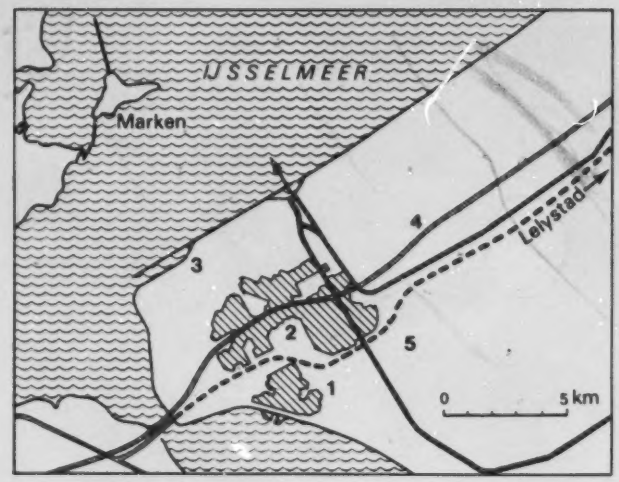
There has been talk of building a permanent river crossing for many years; the drawings lie ready on the shelf, but there were still financial and labour supply problems to be solved (during this period the construction of the Eastern Scheldt dam in the same province required large numbers of specialised workers).

The decision has now been taken and a start will shortly be made on the building of the river crossing, which will be situated in the eastern part of the Western Scheldt estuary between the villages of Kruiningen and Perkpolder (fig. 26).

The crossing will consist partly of a bridge – across the sandbanks and shallows – and partly of a tunnel – under the shipping channel. An artificial island will have to be built in the middle of the river, at the point where the bridge passes into the tunnel.
The work can be completed in about seven years, after which the ferry service which runs at about the same point will be withdrawn. The other ferry connection, between Flushing and Breskens, will continue in operation.
The crossing is being built by a consortium of nine contractors for the "N.V. Vaste Oeververbinding Westerschelde" (Western Scheldt Permanent Crossing Co. Ltd.), in which the province of Zeeland has a 98% share and the two municipalities being connected a 1% share each. The construction costs are covered by a loan of 1,000 million guilders on the capital market, which it is hoped will be recovered from tolls over a period of about 25 years.

2. Water Engineering Works

Lake IJssel Polders
In November 1978 the Minister of Transport and Waterways gave the starting signal for the building of the second section of the new town of Almere. This will be the main nucleus of Almere-Stad, following the nucleus of Almere-Haven (fig. 27), where already (1st January 1979) more than 4,200 people are living. The nucleus of Almere-Stad is planned to accommodate a population of 90,000 persons and to provide 35,000 jobs. A further two or three nuclei will follow, so that the whole town will house 200-250,000 people by the end of the century.



= built-up areas
= canal
= proposed motorway
= proposed railway
1 = Almere-Haven
2 = Almere-Stad
3-4-5 = possible future nuclei

fig. 27 – polynuclear city of Almere.

Photo XXVII shows that, in the centre of Almere-Haven, a form of architecture and town planning is being used which is based more on the traditional Dutch town, so creating a townscape quite different from that in the first section of Lelystad, for example, built more than ten years ago.

About 70% of the inhabitants of Almere-Haven come from the agglomeration of Amsterdam. They particularly appreciate the more attractive living environment – "a house with a garden". Of the economically active population of Almere-Haven 57% still work outside the town, largely in Amsterdam. There is a great demand both for housing and business premises in Almere. There are long waiting lists for homes. 48 firms are new established on the four industrial estates (1st January 1979), most of them in the categories of light industry, wholesaling and offices.

Photograph XXVII – *Centre of Almere-Haven.*

It is still not known when a start will be made on the construction of the railway to Almere and Lelystad (a report about the route was given in the Bulletin for 1977-78, pp. 39-41).

Nothing definite can yet be reported about the Markerwaard. The decision about whether or not to drain this final Lake IJssel polder will be taken in accordance with the Key Planning Decision (PKB) procedure (see p. 66 in this Bulletin and p. 44 in the 1977-78 Bulletin). It is not yet known when the government will take first steps in setting the procedure in motion.

Delta Works

In the province of Zeeland work on the last stage of the Delta Plan is in full swing. Men are hard at work on the construction of the pier dam in the Eastern Scheldt and of the secondary Philips dam. Construction of the Eastern Scheldt dam began in 1966. Three work islands and three dam sections – making up 5 of the total length of 9 kilometres – were built in shallow water. As readers will know, the plans for closing the remaining deep water gaps were changed at the last moment.

The definitive plan for the pier dam provides for 63 openings, in groups of 16, 15 and 32, respectively. A total of 66 piers will be required, each with a bedplate of 25 x 50 metres and with heights varying between 35 and 45 metres. The steel gates will be 42 metres wide. The dam will have its own diesel-powered electricity generating station to supply the power needed to close the gates in periods of stormy weather. The closing operation will take about an hour. A motorway will be built along the top of the dam, 12 metres above the surface of the water.

The amended plan for the Eastern Scheldt will necessitate the construction of two additional secondary dams: the Philips dam and the Oester dam (see fig. 15, p. 36). Work has already been proceeding on the Philips dam for some years. Recently the work island has been completed in which will be constructed two large locks for push trains and a lock for yachts. These locks will have to be provided with a system for separating salt water from fresh water. Construction of the Oester dam began in June 1979.

3. Physical Planning

Reference was made in the last Bulletin to the Key Planning Decision (PKB) procedure, as applied to the taking of important decisions in the field of physical planning (I D G Bulletin 1977-78, p. 44 et seq.).

We give once more below a summary of the main stages of the procedure:

1. Preparation and publication of the policy proposal.
2. Laying open for inspection in libraries, town halls, etc.
3. Public meetings to provide information.
4. Opportunity to submit written observations.
5. Public inquiries.
6. Report of the Advisory Council for Physical Planning.
   The Advisory Council (RARO) is a college in which representatives of many sections of society can make their voice heard, such as spokesmen for agriculture and industry, traffic and transport, nature conservation and recreation, employers and employees, science and local government. In addition to advising the government, one of the RARO's tasks is to organise participation within the framework of the PKB.
7. Government's decision.
8. Debate in Parliament.
9. Possible publication of a Report of amendments.

At present – Spring 1979 – the situation in regard to these decisions is as follows:

Urbanisation Report
With the publication of part e of this Report (part II of the Third Report on Physical Planning in the Netherlands), which incorporates some changes proposed by Parliament, the procedure has been completed. Among other things, the possibility has been left open of designating Leeuwarden and Emmen as growth towns and of adding Leidschendam in the Hague agglomeration to the series of growth centres.

Wadden Sea Rapport
The government decision (part d) was published at the end of 1978. It will be debated in Parliament in the middle of 1979. As described in the previous Bulletin, the conservation of nature has priority in the Wadden Sea and all activities in the area have to be tested against this priority, with consideration also being given to the social importance of such activities. The government has not acceded to the wish of many people to extend the area covered by the P K B to include the Frisian Islands, the adjacent coastal areas and a part of the North Sea. In the administrative sphere the division of the Wadden Sea between provinces and municipalities is being speeded up and interdepartmental collaboration in respect of the area is being pressed forward. International collaboration, particularly with the Federal German Republic, also has a high priority.

Structure Scheme for Electricity Supply (and supplement)
A government decision is still awaited on this. The delay is not unrelated to the increased uncertainty about nuclear power.

Report on Rural Areas
Part b (results of public participation) and part c (report of the Advisory Council for Physical Planning – RARO) of this report have now appeared. The government decision is expected in the autumn of 1979.
We give below a selection of the 795 suggestions received as a result of public participation. They come from discussion groups, farmers' organisations, organisations in the field of nature and the environment, provinces, municipalities, agricultural colleges and individual "participators".

- the division of the rural Netherlands into landscape zones (I D G Bulletin, 1976-77, p. 37) met with general approval, although the zoning itself was often considered too generalised, as were the criteria applied. An appeal was made, for example, to pay more explicit attention to the functions of *forestry* and *open air recreation*. There were also pleas to give many areas a function different from that proposed.

- more care for small settlements, for example, in maintaining a reasonable level of services, limiting second home ownership etc.
- more attention to open air recreation, particularly in and near the city regions. Of interest in this connection is the fear expressed in some ten comments that too much afforestation in the west of the country would threaten the characteristic polder landscape.
- care in expanding or improving the infrastructure.
- a more reserved approach to economies of scale in agriculture; more concern for medium-sized and small farms.
- more publicity and education of the public in the field of nature conservation and landscape management.

The RARO adds to the above that the Report, in view of its general, outline character, requires filling out at the regional and local levels. Little is said in the Report about the necessary administrative machinery and means of financing.

With regard to the *Structure Scheme for Traffic and Transport* the government decision has recently been taken and the parliamentary debate is now awaited.

As far as the *Structure Scheme* for *Navigable Waterways* and *Housing* is concerned, publication of the government decisions is now awaited.

4. Excursions, addresses

For the benefit of the numerous foreign geographers, students and schoolchildren making field trips to the Netherlands, there follows a list of museums, exhibitions, tours etc. which might be included in the programme of such trips. The list also includes the addresses of a number of organisations – relating for example to the Delta and Zuyder Zee works, Amsterdam and Rotterdam – which are often the subject of inquiries at the I D G.

The list obviously cannot be complete; additions and alterations will be given in future issues of the I D G Bulletin.

Place and Institution	Opening times	Address and telephone number
Aalsmeer, Flower auction	Mon-Sat, c. 8-11	Legmeerdijk 313, 02977-34567
Amsterdam		
Historical Museum	Mon-Sat, 9.30-17, Sun 13-17	Kalverstraat 92, 020-255822
National Aviation Museum Aviodome	10-17	Schiphol, Amsterdam, 020-173640
Netherlands Maritime Museum	Mon-Sat 10-17, Son 13-17	Kattenburgerplein 1, 020-254175
Town Planning Dept.; Urban Development Exhibition	Mon-Fri 12.30-16.30, Thurs 18-21 (by appt only)	Keizersgracht 440, 020-222962
Arnhem		
National Folklore Museum - The Open Air Museum	May/Aug 9-18, Sun 11-18 Apr/Sep/Oct 11-17	Schelmseweg 89, 085-452065
Biddinghuizen (E.Flevoland) Flevohof-exhibition of Dutch agriculture; model farms etc.	8.30-18	Spijkweg 30, 03211-514
Enschede		
Twente-Gelderland Textile Museum	Tues-Sat 10-12 and 14-17; Sun 14-17	Espoortstraat 182, 053-319093
Haarlemmermeer		
Cruquius Museum (in former steam pumping station) - history of the Haarlemmermeer	Apr/Sept 9-17, Sat-Sun 10-16, Oct/Nov 9-16, Sat-Sun 10-16, Dec/Mar: by appt only	Cruquiusdijk 32, 032-285704

Place and Institution	Opening times	Address and Telephone number
Heerlen Geological Museum	Mon-Fri 9-12 & 14-17	Akerstraat 88, 045-711910
Kerkrade Mining Museum, Rolduc Abbey	May/15th Sep: Tues-Sat 9-17; 15th Jul/15th Aug: Sun 13.30-17; 15th Sep/Apr: Tues-Fri 13-16.30	Heyendahllaan 82, 045-457138
Kinderdijk, 16 windmills	Apr/October: Mon-Sat 9.30-17.30	near Alblasserdam, 01859-4118
Koog aan de Zaan, Mill Museum	Tues-Sun 14-17	Museumlaan 18, 075-215029
Lauwersoog, Expozee (draining and planning of the Lauwerszee)	May/Sep: Tues-Fri 10-17; Sat-Sun 14-17; Octo/Apr: by appt only	Expozee, Lauwersoog (Fr) 05193-9045
Limmen (NH) Bulb growing museum	Mon-Fri 10-12 and 14-16	Düsseldorperweg 64, 02205-1950
Rotterdam Municipal Information Centre (films, slide series etc.)	Mon-Fri 9-17 (by appt only)	Coolsingel 42, 010-172182
Municipal Water Supply Undertaking: – Biesbos Reservoirs – Berenplaat Waterworks – Kralingen Waterworks	by appt only	Galvanistraat 15 (office), 010-896955
Municipal Port Department (films, slide series etc.)	by appt only	Europoint III, Galvanistraat, 010-896911
De Dubbelde Palmboom - Historical museum (urban history)	Mon-Sat 10-17, Sun 11-17	Voorhaven 12, 010-761533
Prins Hendrik Maritime Museum	Mon-Sat 10-17, Sun 11-17	Burg. 's Jacobplein 8, 010-361044
Schoonoord (Dr.) De Zeven Marken Open Air Museum (Drente c. 1900)	Palm Sunday/Octo: 9-18	Tramstraat 73, 05918-579
Utrecht Hoog Catharijne Information Centre (Urban renewal project; film etc.)	by appt only	Hoog Catharijne, 030-310617
Netherlands Railways Museum	Tues-Sat 10-17, Sun 13-17	Johan van Oldenbarneveldtlaan 6, 030-318514
Vlaardingen Sea Fishery Museum	Mon-Fri: 10-17, Sun 14-17	Westhavenkade 53, 010-348722
Wageningen International Soil Museum (soils from all over world)	8.30-17.15 (by appt only)	Duivendaal 9, 08370-19063
Museum of Historical Agricultural Implements	will open in November 1979	Mansholtlaan 12
Agricultural Research Dept. Visitors' Centre	Mon-Fri 9-17	Mansholtlaan 10-12, 08370-19145
Zaandam The Zaanse Schans (village of traditional Zaan timber buildings, with various small museums)	free admission to village; museums 10-17	Zaanse Schans, Zaandam
Delta Region Delta Expo	Apr/Octo: 10-17; Nov/Mar: by appt only	Haringvliet Locks, Stellendam, 01879-1600 (for appts Nov/Mar: National Tourist Office, Bezuidenhoutseweg 2, The Hague, 070-814191)
Eastern Scheldt Works (visit by bus to construction site of Eastern Scheldt dam, information centre)	10-17	Burgsluis, Schouwen-Duiveland (bus departs from here every half hour for the work island)

Place and Institution	Opening times	Address and Telephone number
Nature Reserves, National Parks Visitors' Centres:		
The Hoge Veluwe National Park - "De Aanschouw"	Apr/Octo: 10-17	Nat. Park Office: Apeldoornseweg 250, Hoenderloo, 05768-441
Texel, Natural Recreation Centre (Texel and Wadden Sea)	Mon-Sat 9-17	Strandpaal 17, De Koog, 02228-741
Municipality of Amsterdam Water Supply Undertaking: visitors' centre in dune water catchment area (water supply and nature)	9-17	Vogelenzangseweg, Vogelenzang, 023-246781
St. Jansklooster; De Foeke (area of ponds and low peat in NW Overijssel)	May/Aug: Wed-Sat 10-17 Sep: Sat-Sun 10-17	Beulakerpad 14, St. Jansklooster, 05274-6644
Nederweert; Mijl op Zeven (De Peel peat bogs, S.E. North Brabant)	Apr/Sep: 9-18, Sat-Sun 10-18	"Mijl op Zeven, Nederweert 04951-41276
Zuyder Zee Region		
Nieuw Land Information Centre (Zuyder Zee Works general: films)	10-17	Oostvaardersdijk, Lelystad, 03200-27799
IJsselmeer Polders Museum, former island of Schokland (geology, biology, archaeology)	Mon-Sat 9-17, Sun 10-18	Schokkeringweg, Ens, North East Polder, 05275-1396
Maritime Archaeological Museum	Mon-Sat 9-17, Sun 10-18	Vossemeerdijk 21, Dronten, E.Flevoland, 03210-3287
Zuyder Zee Museum (history of Zuyder Zee and environs)	Mon-Sat 10-17, Sun 12-17	Wierdijk 18, Enkhuizen, 02280-3844
N.B. The exhibition in Den Oever about the Afsluitdijk, referred to in the I D G Zuyder Zee/Lake IJssel Guide, has been closed.		
Boat Trips/Towns		
Amsterdam – through canals and harbour	throughout the year	Rederij P. Kooy, Oude Turfmarkt 0/125, 020-233810 and others
Rotterdam – through the harbour	throughout the year	Spido Havendienst, Willemskade 14, 010-171911
Other Boat Trips (limited selection; further information from: National Tourist Bureau, Bezuidenhoutseweg 2, The Hague, 070-814191		
Delta Region		
Grevelingen Lake, from Scharendijke	Mid May/Aug	ZWN, Grachtweg 23, Zierikzee, 01110-3751
Haringvliet, from Rotterdam from Willemstad	Mid June/mid Aug Apr/Sep	Spido, Willemsplein 20, 010-135400 Otter, Pr. Christinastraat 61, 01687-2814
Eastern Scheldt, from Burgsluis	Mid May/Aug	ZWN, Grachtweg 23, Zierikzee, 01110-3751
Frisian Lakes		
from Drachten	Jul/mid Aug	Kijlstra, De Tille 13, 05120-12791
from Leeuwarden		Stad Dokkum, Tijnjekade 31, 05100-39290
from Sneek		Harder en van der Werf, 1e Oosterkade 6, 05150-17314
Loosdrecht Lakes		
from Utrecht	Jun/mid Aug	Rondvaartbedrijf Utrecht, Oudegracht t/o 85, 030-319377
from Loosdrecht	Mar/Octo	Wolfrat, Oud-Loosdrechtsedijk 165, 02158-3309

Place and Institution	Opening times	Address and Telephone number
Lake IJssel		
Urk-Enkhuizen	May/Sep	Eerste Urker Passagiers- en Vracht-dienst, Oslolaan 2, Urk, 05277-1320
Enkhuizen-Stavoren	May/Sep	Rederij NACO b.v., Leidsevaart 396, Haarlem, 023-319227

Addresses of organisations not given above:

Municipal Port Department of Amsterdam	Havengebouw, De Ruyterkade 7, Amsterdam	020-221201
Royal Netherlands Tourist Association, ANWB	Wassenaarseweg 220, The Hague	070-264426
Central Bureau of Statistics, CBS	Prinses Beatrixlaan 428, Voorburg	070-694341
Ministry of Cultural, Recreation and Social Welfare, (CRM), Information Department	Steenvoordelaan 370, Rijswijk	070-949233
Department of Waterways, Delta Division, Information Department	van Veenlaan 1, Zierikzee	01110-2851
Government Service for land and Water Use	Griffioenlaan 2, Utrecht	030-859111
Ministry of Economic Affairs, Information Department	Bezuidenhoutseweg 151, The Hague	070-814111
Municipality of The Hague, Information Centre	Groenmarkt 7, The Hague	070-624121
Royal Netherlands Geographical Society, KNAG	Linnaeusstraat 2A, Amsterdam	020-924949
Ministry of Agriculture and Fisheries, Information Department	Bezuidenhoutseweg 73, The Hague	070-793911
National Association for the Conservation of the Wadden Sea	Voorstraat 18, Harlingen	05178-5541
Netherlands Railways, Education and Information Department	Moreelsepark 1, Utrecht	030-353630
Municipality of Rotterdam, Information Department	Coolsingel 40, Rotterdam	010-179111
National Geological Service	Spaarne 17, Haarlem	023-319362
National Water Supply Institute	Parkweg 13, Scheveningen	070-694251
IJsselmeer Polders Authority, Information Department	Zuiderwagenplein 2, Lelystad	03200-99111
Rijnmond Authority, Information Department	Vasteland 96/104, P.O. 23078, Rotterdam	010-111320
State Printing and Publishing House	Chr. Plantijnstraat, Den Haag	070-789911
Soil Mapping Foundation	Staringgebouw, Marijkeweg 11, Wageningen	08370-19100
Recreation Foundation	Statenplein 1, Den Haag	070-500100
Topographical Service	Westvest 9, Delft	015-120846
Municipality of Utrecht, Information Department	Slachtstraat 12, Utrecht	030-328511
Ministry of Transport, Waterways and Communications, Information Department	Plesmanweg 4, The Hague	070-747474
Ministry of Public Health and Environment Hygiene, Information Department	Dr. Reijersstraat 8-12, P.O. 439, Leidschendam	070-209260
Ministry of Housing and Town and Country Planning, Information Department	van Alkemadelaan 85, The Hague	070-264201

IV. – THE INFORMATION AND DOCUMENTATION CENTRE FOR THE GEOGRAPHY OF THE NETHERLANDS

Report for 1978 and activities during the first half of 1979.

During the year 1978 the I D G received 1,034 requests, mostly in writing, for information and/or documentation. This was an increase of 20% over 1977. The letters came from 52 countries, with the largest numbers originating from the immediately neighbouring countries – the Federal German Republic, Belgium, United Kingdom and France.

The I D G publishes in close co-operation with the Ministry of Foreign Affairs two series of information booklets, i.e. one with information material about the geography of the Netherlands as a whole, and one with publications about particular regions.

In the first series there appeared during 1978 and the first half of 1979 the Japanese, Arabic, Indonesian, Polish, Italian, Portuguese and Spanish versions of the "Pictorial Atlas of the Netherlands", the Arabic version of the "Compact Geography of the Netherlands" and the I D G Bulletin for 1977 – 78 in five different language versions. In the second series there appeared in the spring of 1978 a second, completely revised edition of the Guide to the South West Netherlands (Rotterdam/Europoort/Delta).

During the past year work was nearly completed on a revision of the "Compact Geography of the Netherlands" (= 3rd edition) and a slide series about the geography of the Netherlands. Both will appear during the course of 1979 or early 1980. The Guide to the Randstad promised in the last Bulletin will appear somewhat later than expected, probably during the course of 1980. *)

Since 1st August 1978 the manager of the I D G Bureau has been available for a full working week instead of only three days a week, which means that the Bureau is now open on every week-day, but it is still advisable to make an appointment for a visit (tel.: (0)30-531378).

In October 1978 a Dutch-German conference about the revision of geography textbooks and teaching aids took place in Utrecht. The meeting was a sequel to a similar bilateral conference held in Brunswick, Fed. German Rep., in 1973. At the conference extensive criticism was expressed on both sides about the treatment of the geography of the one country in the textbooks etc. of the other. A summary of this criticism and the ensuing discussions, as well as a number of recommendations for improvement, are contained in a detailed Final Report (Dutch text, five page English summary. A limited number of copies is still obtainable from the I D G).

Aims and activities

For those readers who are making the acquaintance of the I D G for the first time through the medium of this Bulletin there follows finally, a summary of the I D G's origins, aims and activities.
The Information and Documentation Centre for the Geography of the Netherlands is a non-profit making body, whose aim is to supply information and documentation about the geography of the Netherlands to institutions and bodies outside the Netherlands concerned with education, study and information, in the widest sense, about that country.

The idea of establishing such centres derived from a conference about the correction of geography school textbooks, held in Ireland in 1963 under the auspices of the Council of Europe. The Centre has been functioning since 21st September 1964. Under the pressure of circumstances (a parliamentary question about incorrect statements about the Netherlands in a foreign geography textbook) activities had to begin before a definitive form of organisation had been worked out. On 9th December 1969 the Centre became a foundation and, on 1st April 1971, the Bureau of the Centre, established in the Geography Department of the University of Utrecht,

*) for a complete list of all current I D G publications see the literature summary on p. 74 of this Bulletin.

was able to begin operating. The necessary funds for the functioning of the Bureau derive from an annual subsidy of the Ministry of Education and Science; publications, exhibitions, conferences etc. are largely financed by the Ministry of Foreign Affairs.

The work done so far can be divided into a number of categories:

- replying to letters from all parts of the World. The letters contain a great variety of requests for information about the geography of the Netherlands, as well as for the supply of visual material, for addresses or assistance in the preparation of field excursions.
- the reception of foreign geographers preparing, for example, a publication about the geography of the Netherlands or a field excursion. The Bureau offers, inter alia, the possibility of consulting a bibliography of foreign language publications about the geography of the Netherlands and a modest collection of photographs.
- the compilation of information in different languages (brochures, guides, wall map, bulletin; see page 74), in collaboration with the Ministry of Foreign Affairs.
- the compilation of a bibliography of foreign-language publications, principally published since 1945, about the geography of the Netherlands. Lists have been compiled for distribution of the titles in the English, French and German languages contained in the bibliography. There is also a list of literature in the Dutch language. In addition a card-index has been made of all the visual material (maps, photographs, films etc.) illustrating the geography of the Netherlands.
- the organisation of bilateral conferences on the mutual revision of geography teaching material.
- attempting to publicise the Centre's existence and mode of operation among as wide as possible a circle of foreign geographers.

BIBLIOGRAPHIE

Recent publications on the geography of the Netherlands

Agriculture in the Netherlands; leading article in Bulletin, 1977-78 (pp. 5-29)

Central Bureau of Statistics
- Bevolking der gemeenten van Nederland op 1 januari 1978; 70 pp., Price: Hfl. 9,–
  (Population of the municipalities of the Netherlands, 1st January 1978) *
- Regionaal Statistisch Zakboek 1977; 240 pp., price: Hfl. 23,–
  (Regional Statistical Review, 1977)
- Statistical Yearbook of the Netherlands 1977; 370 pp., price: Hfl. 49,– *
- Statistisch Zakboek 1978; 365 pp., price: Hfl. 14,25
  (Pocket Yearboek 1978)*
- 75 Jaar Statistiek van Nederland; 308 pp., price: Hfl. 35,–
  (75 Years of Statistics in the Netherlands), 1974

The Hague, Staatsuitgeverij. * annually published

Constandse, A.K.
Planning and creation of an environment; experiences in the IJsselmeerpolders.
Lelystad, 1976
Published on the occasion of the UN Conference on Human Settlements, Vancouver, 1976.
Brief description of the Zuyderzee scheme, emphasizing the physical planning of the settlements in the polders, and the shifts of opinion about this.

Havenbedrijf der Gemeente Rotterdam
- Review Map (1:80.000) of the Rotterdam/Europoort port area
- Statistical Review, annually published, 36 pp.

Industry in the Netherlands; leading article in Bulletin, 1976-77 (pp. 5-22)

Luchtatlas van Nederland (Pictorial Atlas of the Netherlands)
185 Photographs and Maps, partly in multicolour print, text in Dutch
(compiled under the auspices of the Royal Dutch Geographical Society)
Bussum, Romen, 1978. Price: Hfl. 29,50

Ministry of Agriculture and Fisheries
- Aspects of Dutch agriculture; 56 pp.
- Dutch agriculture in facts and figures; 15 pp.

The Hague, 1979.

Ministry of Foreign Affairs
The Kingdom of the Netherlands; facts and figures.
This publication comprises a.o. the following parts:
- Country and people (geography, population)
- The Economy
- Agriculture and fisheries
- Transport and Communications
- Health and Environmental Protection
- Housing and Physical Planning
- Public Works

The Hague, 1978/1979

Ministry of Housing and Physical Planning, The Hague
- The relationship between physical planning policy and economic policy; 1977, 25 pp.
- The rules of physical planning in the Netherlands, 1976, 35 pp.
- Summary of the Report on urbanisation in the Netherlands, 1976, 14 pp.
- Summary of the Rural Areas Report, 1978, 36 pp.

Ministry of Transport and Public Works, The Hague
- The Delta project; 1977, 15 pp.
- Room at last; the IJsselmeerpolders described and illustrated; 1976, 48 pp.
- Transport policy and the development of the transportation network in the Netherlands; 24 pp.

Physical Planning in the Netherlands.
Special issue "Planning and Development in the Netherlands"; 9 (1977) Nr. 2.

Pinder, D.
The Netherlands (Studies in industrial geography).
London, Hutchinson, 1978, 194 pp.

Rijksdienst voor de IJsselmeerpolders, Lelystad
Flevoland, Facts and Figures 1978, 36 pp.

Tamsma, R.
The Netherlands in one hundred maps.
Amsterdam, Royal Dutch Geographical Society, 1977.
Special issue T.E.S.G.

Publications IDG/Ministry of Foreign Affairs, Utrecht/The Hague

- Compact Geography of the Netherlands; 3rd. ed., 1979, 44 pp.
- Pictorial Atlas of the Netherlands; 1977, 40 pp.
- Wall Map of the Netherlands, scale 1:325,000.

These publications are obtainable in the following language versions:
Dutch – German – English – French – Danish – Spanish – Portuguese – Italian – Polish – Russian – Indonesian – Japanese – Arabic

- IDG-Bulletin (annually)
  Language versions: Dutch – German – English – French – Spanish

- The South-West Netherlands; 2nd. ed., 1977, 60 pp.

- Zuyderzee/Lake IJssel; 1975, 70 pp.
  Language versions of these publications (at the same time excursion guides):
  Dutch – German – English – French

Periodicals

- T.E.S.G. (Tijdschrift voor Economische en Sociale Geografie; Journal of Economic and Social Geography). 6x per year; partly in English.
  Subscription rate: Hfl. 87,–
  Royal Dutch Geographical Society (KNAG), Mauritskade 63, Amsterdam.

- Rotterdam-Europoort-Delta
  4x per year; in English
  Havenbedrijf der Gemeente Rotterdam, address: Europoint III, Post Box 6622, Rotterdam.

Atlases

- Meulenhoff-Educatief b.v.
  Schoolatlas for secondary and further education,
  Amsterdam, 1978, price: Hfl. 42,50.

- Wolters-Noordhoff b.v.
  De Grote Bosatlas; 48th rev. ed., 195 pp.
  Groningen, 1976, price: Hfl. 49,75

Topographical Maps

Topografische Dienst, Westvest 9, Delft

- Scale: 1:10.000
  only in black-and-white; price: Hfl. 12,50
- Scale 1:25.000 and 1:50.000
  in black-and-white, price: Hfl. 4,50
  in multi-colour print, price: Hfl. 8,–
  See page 78

Transparencies

FIBO-Beeldonderwijs, Zeist: Series of colour-transparencies (textbooks in Dutch)

- De Zuiderzeewerken (20)
- Deltawerken (31)
- Waddenzee en Waddenland (Wadden Sea Area; 48)
- De Randstad Holland (40)
- Rotterdam (25)
- Amsterdam (26)
- Het Polderland (20)
- Langs de grote rivieren (the big rivers; 20)
- De kustduinen (the dunes; 20)
- Zuid-Limburg (20)
- De kust (the coast; 60)
- Laag-Nederland (Low-Netherlands; 60)
- Onze waterwegen (waterways; 60)
- Ons drinkwater (our drinking water; 15)

The prices vary between Hfl. 20,- and Hfl. 41,–
For copyright and orders: FIBO-beeldonderwijs, Utrechtseweg 66-68, Zeist.

Meulenhoff-Educatief Amsterdam

- Series of colour-transparencies (aerial photographs) accompanying the textbook "De Geo Geordend",
  III. 200 transparencies; price: Hfl. 243,25.
  Textbook (in Dutch): price: Hfl. 32,25.

Polyvisie, colour slide series:

- What is happening to the Wadden Sea ? (72 slides)
- The water supply of the Netherlands (44)
- Threatened landscapes (Tape slide presentation, 96 slides with tape cassette)
- The energy supply of the Netherlands (36)
- Sea becomes land (26)

- Southern Flevoland (12)
- The enclosing dam (12)
- Dike construction (12)
- Reclamation (12)
- The Dutch Coast (31)
- Our modern ports (24)
- Europoort (12)
- Rotterdam, gateway to Europe (12)
- The blast furnaces (12)
- Netherlands Railways (12)

Prices vary from Hfl. 11 50 to Hfl. 130.00, depending upon the number of slides.
For copyright and orders: Polyvisie, 's-Gravelandseweg 78a, Hilversum.

Transparencies for the overhead-projector

IVAC, Brussels.

- Transparencies for the overhead-projector, series no. 4005, comprising the following parts:

1. Land uit zee (land reclamation, 5 transparencies)
2. Nederland; bevolkingsexplosie (growth of population; 4)
3. Tot voor 30 jaar overwegend een landbouwland (agricultural economy; 5)
4. Groeiende industriestaat sinds WO-II (industry; 5).

Wall Maps

Van Goor, Zonen, The Hague

- Staatkundige kaart van Nederland (The Netherlands; provincies); 1:275,000. price Hfl. 165,–
- Bedwongen waterland (water control, polder); 85x115 cm., price: Hfl. 74,50
- Threatened waterland (lake reclamations, Zuider Zee works, Delta Plan etc). 85x115 cm. (with teachers' notes), Hfl. 95.75.

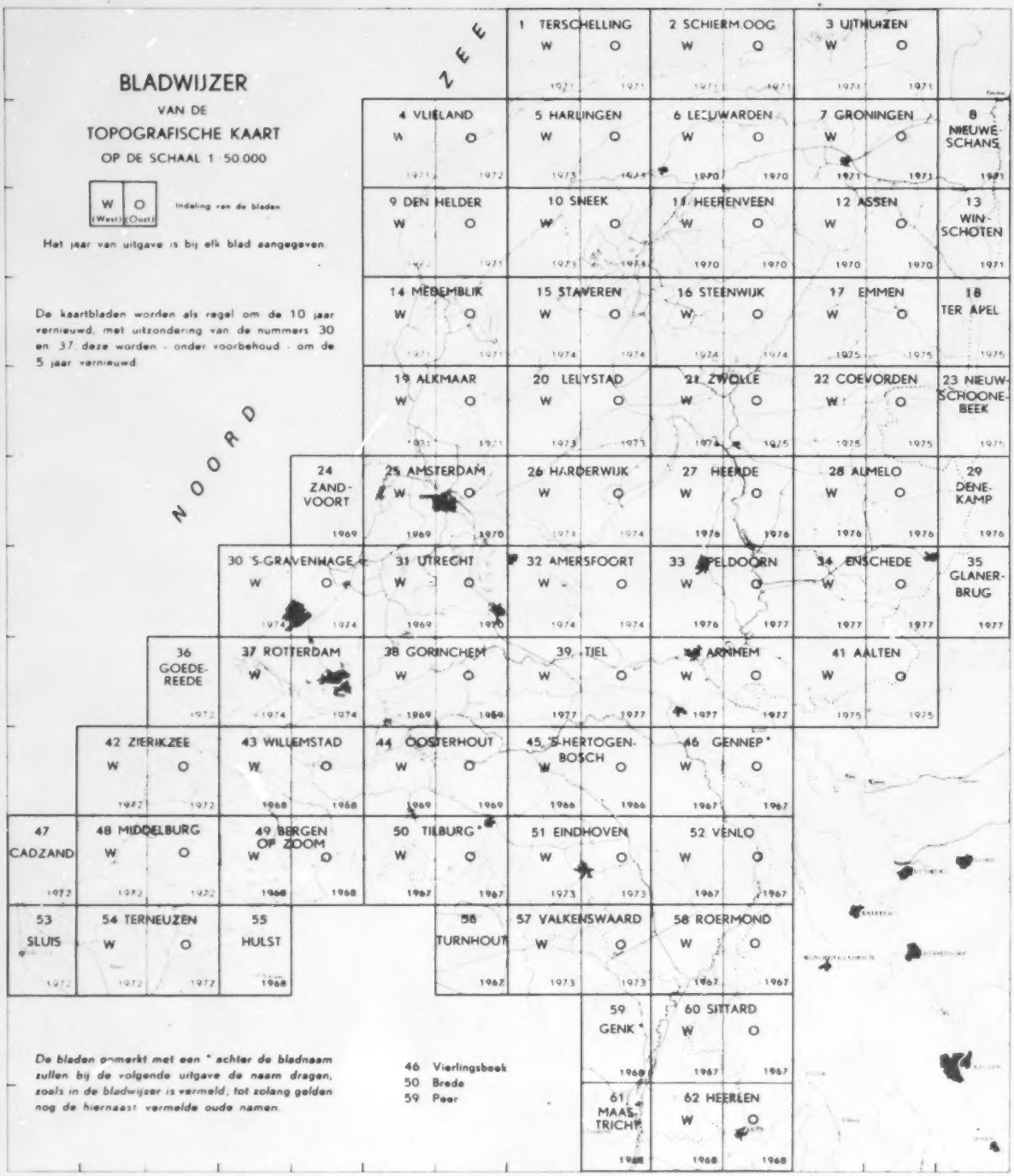
IDG/Ministry of Foreign Affairs

- Wall Map of the Netherlands, 1:325,000 (types of landscape)

Wolters-Noordhoff, Groningen

- Tweede Wandkaart van Nederland; 1:200,000 (Wal Map, types of soil), Hfl. 236,–
- Derde Wandkaart van Nederland; 1:200,000 (Wall Map, land use); Hfl. 236,–
- Regiokaarten (regional maps, 110 x 140 cm):

– Noord-Nederland	Hfl. 129,25
– Randstad Holland	Hfl. 129,25
– Deltagebied	Hfl. 129,25
– IJsselmeergebied	Hfl. 129,25
– Rivierengebied	Hfl. 129,25
– Industriegebied van Noord-Brabant	Hfl. 129,25
– Oost-Nederland	Hfl. 129,25
– Zuid-Limburg	Hfl. 113,50


BLADWIJZER
VAN DE
TOPOGRAFISCHE KAART
OP DE SCHAAL 1 : 50.000
W (West) O (Oost) Indeling van de bladen
Het jaar van uitgave is bij elk blad aangegeven
De kaartbladen worden als regel om de 10 jaar vernieuwd, met uitzondering van de nummers 30 en 37, deze worden - onder voorbehoud - om de 5 jaar vernieuwd
NOORD ZEE
1 TERSCHELLING W O 1971 1971
2 SCHIERMONNIKOOG W O 1971 1971
3 UITHUIZEN W O 1971 1971
4 VLIELAND W O 1971 1972
5 HARLINGEN W O 1973 1973
6 LEEUWARDEN W O 1970 1970
7 GRONINGEN W O 1971 1971
8 NIEUWE-SCHANS 1971
9 DEN HELDER W O 1971 1971
10 SNEEK W O 1973 1973
11 HEERENVEEN W O 1970 1970
12 ASSEN W O 1970 1970
13 WIN-SCHOTEN 1971
14 MEPPEL W O 1971 1971
15 STAVEREN W O 1974 1974
16 STEENWIJK W O 1974 1974
17 EMMEN W O 1975 1975
18 TER APEL 1975
19 ALKMAAR W O 1971 1971
20 LELYSTAD W O 1973 1973
21 ZWOLLE W O 1974 1975
22 COEVORDEN W O 1975 1975
23 NIEUW-SCHOONE-BEEK 1975
24 ZAND-VOORT 1969
25 AMSTERDAM W O 1969 1970
26 HARDERWIJK W O 1974 1974
27 HEERDE W O 1976 1976
28 ALMELO W O 1976 1976
29 DENE-KAMP 1976
30 'S-GRAVENHAGE W O 1974 1974
31 UTRECHT W O 1969 1970
32 AMERSFOORT W O 1974 1974
33 APELDOORN W O 1976 1977
34 ENSCHEDE W O 1977 1977
35 GLANER-BRUG 1977
36 GOEDE-REEDE 1972
37 ROTTERDAM W 1974 1974
38 GORINCHEM W O 1969 1969
39 TIEL W O 1977 1977
40 ARNHEM W O 1977 1977
41 AALTEN W O 1975 1975
42 ZIERIKZEE W O 1972 1972
43 WILLEMSTAD W O 1968 1968
44 OOSTERHOUT W O 1969 1969
45 'S-HERTOGEN-BOSCH W O 1966 1966
46 GENNEP * W O 1967 1967
47 CADZAND 1972
48 MIDDELBURG W O 1972 1972
49 BERGEN OP ZOOM W O 1968 1968
50 TILBURG * W O 1967 1967
51 EINDHOVEN W O 1973 1973
52 VENLO W O 1967 1967
53 SLUIS 1972
54 TERNEUZEN W O 1972 1972
55 HULST 1968
56 TURNHOUT 1967
57 VALKENSWAARD W O 1973 1973
58 ROERMOND W O 1967 1967
59 GENK * 1969
60 SITTARD W O 1967 1967
61 MAAS-TRICHT 1968
62 HEERLEN W O 1968 1968
De bladen omerkt met een * achter de bladnaam zullen bij de volgende uitgave de naam dragen, zoals in de bladwijzer is vermeld; tot zolang gelden nog de hiernaast vermelde oude namen.
46 Vierlingsbeek
50 Breda
59 Peer
Topografische Dienst Delft
Uitgave 1978

Each of the lettered sections is a sheet in the 1:50,000 map series; each of these sections covers 4 sheets of the 1:25,000 series. The 1:50,000 map sheets are also available from the Topografische Dienst as "Waterstaat" (Water Control) maps, Geological maps (not yet complete) and Soil maps (not yet complete).